Journal of Soil & Water Conservation

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Soil Conservation Society of America

NEWS Notes and Activities

To Advance the Science and Art of Good Land Use

Secretary's Column

You are probably wondering why NEWS NOTES and the JOURNAL OF SOIL AND WATER CONSERVATION are reaching you in this manner. Frankly, it is an attempt to give you better service and at the same time reduce our cost of production. About 18 months ago the JOURNAL became a bi-monthly instead of a quarterly. This means that we are contacting members ten times each year as compared to the previous eight. Cost of producing NEWS NOTES last year was $1,240. In addition we spent nearly $300 for envelopes in which to mail the JOURNAL. By using NEWS NOTES as the cover for the JOURNAL we will save $800 per year. It is true we will lose 14 pages of NEWS NOTES during the year but we hope to develop additional sections in the JOURNAL with the end result that you will continue to receive the same information. In other words we are making our envelopes "work" for us.

We hope that at some future date it will be possible for us to have a full-time editor on the staff and to send you the JOURNAL 12 times per year. We believe that is the service you desire. At the same time we want to continue NEWS NOTES as this will allow us to reach you in an informal manner and to carry information regarding organizational activities not normally considered as JOURNAL material.

Other publications have adopted similar procedures. As you read this you may desire to carefully remove the cover pages which are merely stapled as a part of the JOURNAL. This will allow you to file or bind your JOURNAL in the normal manner and at the same time your NEWS NOTES will appear more familiar as the back page will then be associated with this page you are now reading.

We hereby solicit your opinions regarding this procedure. We hope you will send us information as to the condition of your JOURNAL after it travels through the mail in this manner. If this method does not prove satisfactory future adjustments will be made. Some have suggested a monthly multilithed NEWS NOTES but as we are working for the day when you will receive the JOURNAL 12 times per year we thought it best to try this method.

Recently another organization, similar to the *Society*, gave the information their members actually receive $12 worth of services per year. The figure included cost of their publications. Our dues are $3.00 and $5.00 and you can readily determine that our services cannot equal theirs. For example we would like to publish a directory of membership but the cost is prohibitive. We have had suggestions regarding other projects the *Society* should sponsor. This adjustment in the publication of NEWS NOTES is what we consider an efficiency step.

It takes careful planning, budgeting and management to carry forward an organization such as the *Soil Conservation Society of America*. The council members and others have devoted much time and effort and as a result we have a growing organization. Many members have been cooperating with the plan to increase membership. Membership is the key to the future success of the *Society*. It will allow increased activity for chapters, the JOURNAL will be more attractive as an advertising medium and we will be able to continue with a low membership fee.

Yours for more in '54!

H. Wayne Pritchard

News Notes and the Journal of Soil and Water Conservation are now combined. You may remove this cover from your Journal but first you may desire to read the explanation in the Secretary's column at the left.

CURRENT MEMBERSHIP NEWS

The national membership committee has recently mailed a letter to all members of the Society asking their cooperation in a concerted effort to secure 1,000 new members. Harold M. Rhodes of Morgantown, West Virginia, chairman of the committee, has asked that March be designated by Society members as *"One for the Society."*

The Society has made recent gains and on February 1, 1954, the membership totaled 5,510.

How does your state rank? The February 1st listing was as follows:

Tex.	250	Tenn.	59
Ia.	233	Ga.	59
W. Va.	229	Ut.	53
Mich.	222	Ala.	52
N. Y.	205	Mont.	51
Wis.	193	Ark.	50
Penna.	185	Mass.	41
Nebr.	179	Conn.	30
N. C.	178	Vt.	29
Ill.	173	La.	25
Calif.	168	N. H.	24
Okla.	162	Ida.	20
Fla.	158	Nev.	20
Kan.	150	R. I.	18
Colo.	146	Me.	17
Ky.	142	Wyo.	14
Md.	142	Del.	13
Va.	119	D. C.	92
S. C.	118	P. R.	41
O.	117	H. I.	8
S. Dak.	112	Alas.	2
Minn.	91	V. I.	11
N. Mex.	91	Ont.	93
N. Dak.	91	Sask.	9
N. J.	87	Que.	7
Wash.	79	Man.	7
Ore.	65	B. C.	4
Ariz.	64	Alba.	2
Ind.	64	For.	251
Mo.	63	Stud.	67
Miss.	61	Tot.	5,510

President's Column

Committee appointments are almost complete and we hope to have the complete lineup ready for publication within the very near future. There will be a little delay in publishing complete committee membership lists because my headquarters were moved February 1 and I will not have a secretary until after the 22nd. Meantime, committee work is underway.

Have you talked to your friend about membership in the Society? You hold the future of your society in your hand. Go out and get one or more new members and you'll be making a direct contribution to the growth of the Society. Harold Rhodes, your membership chairman, and other members of the committee are working hard. They need your help.

Dr. Firman E. Bear reported an experience in which he sold two memberships during a luncheon engagement. If every member did as well, we would build our membership up to a solid 15,000.

Our Organization and Policy Committee, under the chairmanship of Roy Hockensmith, is working on Membership Classification in an effort to iron out some difficulties there. It looks as if we must make some adjustments in classification so as to get a full membership fee, instead of the present $3.00 that we collect from Associate members. If you'll stop and figure a bit, you must realize that our present Associate Membership fee is not helping with the financial load of the Society. By the time we send the JOURNAL and other material that is mailed to all members, we just about use up a $3.00 fee without leaving anything to help pay necessary overhead expenses of the Society.

It is not the function of the President of the Society to tell you how you should vote when changes in our Constitution and By-Laws are proposed, but he does have a definite responsibility for helping to acquaint the members with some of the basic facts. One of these facts is that we are not going to build a sound financial structure with our present $3.00 Associate Membership fee. Both of Dr. Bear's friends were eligible for Associate Membership, but both would have been glad to pay a full $5.00 membership fee.

Our Chapter Activities Committee, under the chairmanship of Harold Dean, has been reorganized into four sections with an over-all chairman and also with a chairman of each sub-Committee. We believe this arrangement will help us to increase

(*Continued on page 3, col. 1*)

Volume 9, No. 2 **March, 1954**

Water Rights and Our Expanding Economy
. . . C. E. Busby

The Federal Partner in Watershed Conservation
. . . Raymond A. McConnell, Jr.

Contributions of Western Public Lands to Conservation
. . . R. W. Bailey and G. W. Craddock

Effectiveness of Cover in Reducing Soil Splash by Raindrop Impact
. . . Ben Osborn

The Betsie and Platte Watersheds Improvement Project
. . . Arvid Tesaker

Book Reviews: Irrigation Development and Public Water Policy; Developing Farm Woodlands; Farm Management Analysis; Soils and Land of Michigan and others.

Soil saver at work

This is a good cover crop that has created a safety zone to protect the soil. Thick and lush, it breaks up each pelting raindrop, reducing a downpour to a gentle, helpful rain.

Such soil-saving grasses and legumes are always hard at work, fighting erosion, as well as performing their other soil-building tasks.

Working just as hard, of course, are local soil conservationists and agricultural agents. They have the knowledge and the desire to help farmers fight the destructive forces of nature.

It is a ceaseless fight—but the prize is great: A healthier, happier, more prosperous nation.

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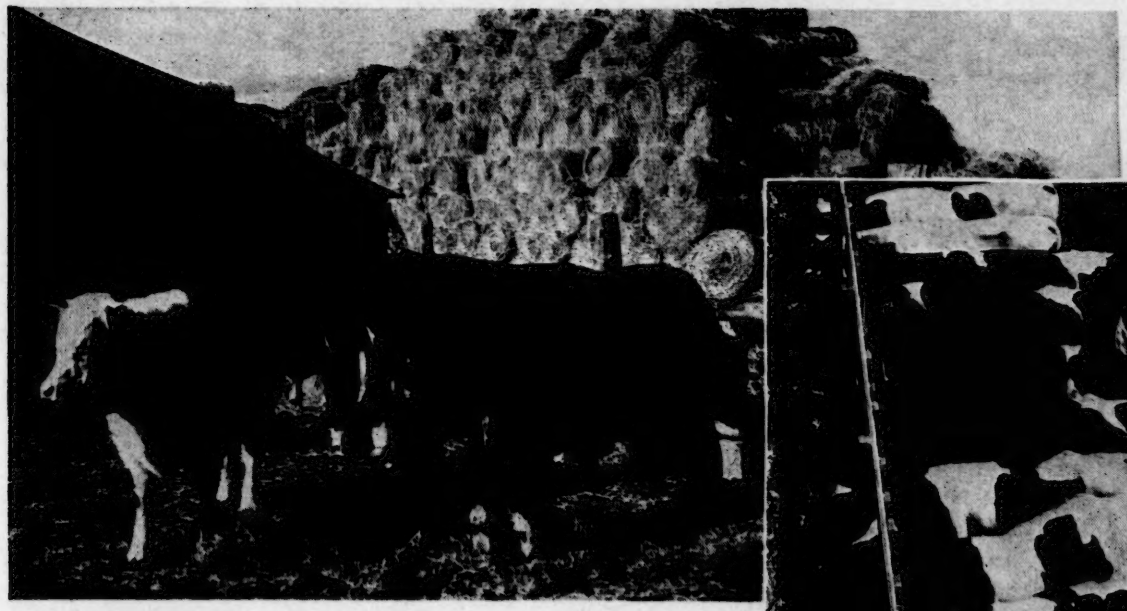


POWER
turns soil-conserving grass into milk and meat

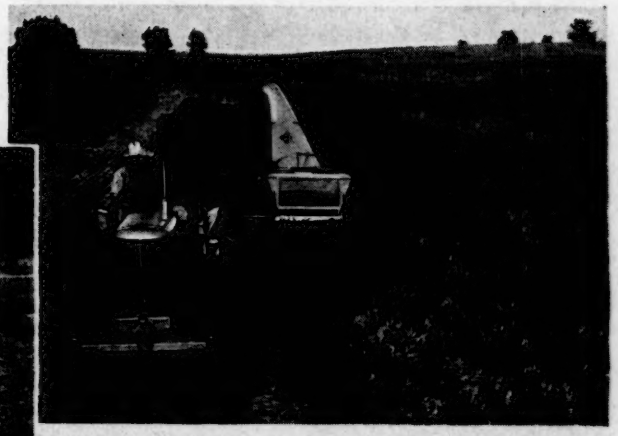
Grassland agriculture is a tool against floods . . . a guardian of our water supply . . . a shield for soil against high winds. And the foods that come from grass sustain the health of our people.

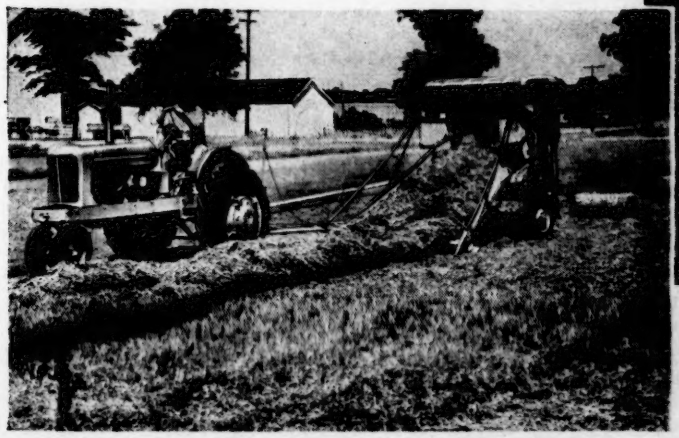
Now, power machinery is helping farmers everywhere turn more grass into milk and meat . . . *with much less labor.*

Wide interest has arisen in two new systems of harvesting and feeding grass. One method is field chopping the growing grass or legumes, and hauling it directly to livestock, or ensiling it for *year 'round* feeding. The Allis-Chalmers Forage Harvester equips the farmer for this operation. This practice stimulates production of nutritious feed, prevents hoof damage to pastures, and helps control weeds. More energy goes into milk and meat.

Another method is *self-feeding baled hay.* Round bales are fed whole in the barn, in the feedlot or on the range. They resist rainfall from above and dampness from the ground below. The hay is rolled under pressure by the ROTO-BALER and wrapped with ordinary binder twine — fresh-baled quality is preserved.

Through these systems of livestock feeding our land resources will be better used and conserved.





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Full-width furrows on contour curves. Break-Away mounted plow pulls beams and bottoms from proper pivot-point of plow frame—to prevent cutting in or out on curves. Break-Away safety release, also built into plow, prevents damage by buried stones or stumps. Two and 3-bottom sizes. For all three sizes of Case Tractors with Eagle Hitch.

Pasture Renovation Harrow has 24 or 26-inch blades spaced 10½ inches apart to bite deep in hard, sod-bound, overgrown soil. Makes way for lush grass on rough, stony, stumpy land.

Field Shredder slashes and beats trash into bits, to remain as mulch or mix with soil for humus formation. Shreds corn and cotton stalks, potato vines, sage brush, other wild growth and crop residues.

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Wide One-Way Plow turns soil to receive and retain rain, sets stubble to resist blowing, hold soil and snow. Sizes to cut 12, 15, or 18 feet wide, easily adjust to trail for transport. Tandem rear wheels, one running on unplowed land, the other in furrow, give positive depth control in uneven ground.

Soil and water conservation practices are essentially good farming, and should be applied mainly with regular farm machinery. Case implements are designed with an eye to making such conservation methods easy and economical.

The new Case Diesel Tractor, shown at left, is available factory-equipped with power steering, also with constant power take-off and dual-valve constant hydraulic control, making it the most complete of farm diesels. Multiple cylinder heads, single-plunger injection pump, and a six-point fuel filtering system combine diesel fuel economy with the upkeep economy for which Case machines are known.

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That's what an Oliver diesel tractor gives!

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Oliver, *first* to offer the American farmer a *complete* line of *true diesels*—from the 2-plow "66" to the 4-5 plow "99"—was also first to provide these *practical* farm power advancements, now associated universally with real tractor modernity:

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How to turn "knowing" into "doing"

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However, when applying manure or fertilizer, NEW IDEA equipment has none of these shortcomings.

For example: NEW IDEA Fertilizer Spreaders are guaranteed to spread "Any fertilizer in any condition in any amount (between 10 and 5000 lbs. per acre) . . . accurately, uniformly . . . without clogging . . . or money back." Through the main box or grass seeder attachment you can sow grains, grass and legume seed with down-to-the-ounce accuracy.

For manure spreading, any one of four tough NEW IDEA Spreaders (65 bu., 75 bu., 90 bu., 120 bu. PTO) give you exactly what you want. You control speed and rate right from the tractor seat. 100 high-carbon steel, staggered cylinder teeth thoroughly shred manure for the pulverizing widespread to apply as an even, nourishing, tilth-building blanket . . . thick or thin according to the needs of your soils.

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Journal of SOIL AND WATER CONSERVATION

VOLUME 9
NUMBER 2

TO ADVANCE THE SCIENCE AND ART OF GOOD LAND USE

This JOURNAL is the official organ of the Soil Conservation Society of America. It is owned, edited, and published bi-monthly by the Society.

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***COVER:** Recent estimates indicate that the industrial requirements for water by 1975 will be in excess of 275 per cent of our present needs. Water for agricultural, domestic and recreational uses are also increasing and must be met.*

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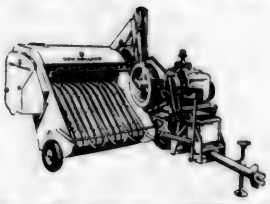
Farmers follow a "Super 77" during a field test

"Meet the world's fastest twine-tie baler"



HERE'S THE INSIDE STORY OF **NEW HOLLAND'S** NEW "SUPER 77"

When the famous "77" twine-tie went on the market in 1950, New Holland engineers went to work all over again. Their problem: how to get more capacity from what was then the fastest baler without sacrificing dependability. "Beat friction," said the engineers, "and you beat the record!"

By 1952, the "77" had become the largest selling baler in the country. But engineers read field reports and kept on working. This February they were ready with the new "Super 77"—a twine-tie that bales up to 12 tons of hay an hour—*and more*—proved in supervised field tests throughout the United States.

How was the big increase made? Here are examples. The plunger now rides on four rollers with sealed ball bearings instead of slide blocks. Sealed precision bearings were also installed on the tightener pulley, main drive pinion shaft, pickup and auger drive and pickup cam followers.

Design of the shearing knives (stationary and plunger) was changed to V-shape for most efficient slicing. Wadboard and wadboard linkage were made more rigid and compact—lubrication easier and more positive. Parts, as in the overcenter assembly, were reduced for simpler adjustment.

Result: By simply improving the efficiency of a sound design, New Holland engineers developed the fastest twine-tie in the world. And farmers advanced further in their race against time to put up more and better feed with greater economy.

The New Holland Machine Co., New Holland, Pa. A subsidiary of The Sperry Corporation.

NEW HOLLAND *"First in Grassland Farming"*

Contributions of Western Public Lands to Conservation

REED W. BAILEY AND GEORGE W. CRADDOCK

Here is an account of the many contributions which the western public lands have made to conservation by two westerners who have long served the West. They relate how the present-day concept of conservation—sustained availability of soil and water resources with use—was born in the West, and how early foresters, struggling to place the public forest and range lands under management, fostered the development of basic conservation principles, useful technical knowledge, new schools, trained practitioners, and public recognition of the importance of conservation on all lands. They point out, too, that the conservation problem now at hand is to restore and maintain the productivity of the public lands under the stress of ever-increasing demands for timber, forage, recreation, and useful water. This, the authors believe, is a continuing public responsibility.

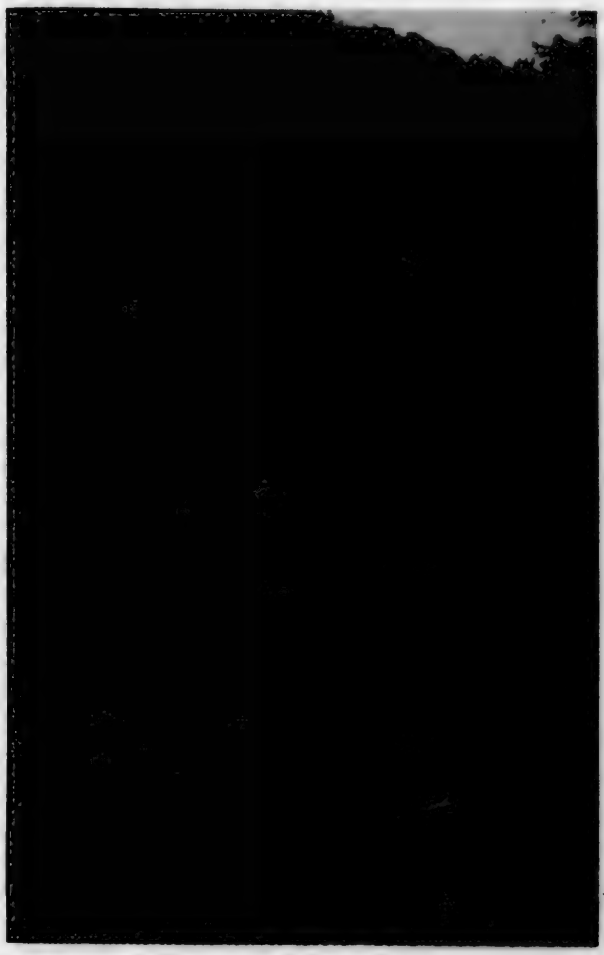
THIS MEETING, the subjects discussed, and the people and organizations participating in it, indicate the wide and diverse interest in the conservation of soil and water. The reports we have heard bear testimony to the great strides that have been made in conservation during the past two decades, particularly on agricultural lands, and this Society can be justly proud of its role in fostering that progress.

While this movement for agricultural lands has been gaining momentum, conservation has also moved forward on our western public lands. Those lands have in fact made many contribuitions to the whole field of conservation and can make many more. I welcome this opportunity to describe some of those contributions. I also wish to discuss some important decisions which need to be made about the future stewardship of the public lands—decisions which in my opinion directly affect their future usefulness as sources of vital water supplies, of essential crops of timber, forage, and wildlife, and of desirable opportunities for recreation and inspiration.

Western Public Lands

I refer specifically to the 331 million acres of uncultivated forest and range lands now in Federal ownership within the 11 western states. About 137 million acres of these lands are high-elevation, rugged, humid mountains within the national forests. About 180 million acres are less elevated, mostly arid, foothills and valleys under the jurisdiction of the Bureau of Land Management. An additional 14 million acres of land having outstanding esthetic, educational, and recreational values are within national parks and monuments.

Figure 1. The humid forested portions of the western public lands are the principal sources of water for the entire West. Far reaching ecologic and hydrologic changes can be set in motion on these steep and rugged lands by fire and improper use of the timber and forage resources. The public has such a great stake in the continued yield of clear and regular streamflow that watershed damage to these lands should not be left to chance.



This paper by Reed W. Bailey and George W. Craddock was presented at the Eighth Annual meeting of the SCSA held in Colorado Springs, Colorado, November 7, 1953. Mr. Bailey is director of the Intermountain Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture with headquarters at Ogden, Utah. He is a member of the A. S. S. C. and internationally recognized as an authority on watershed problems.

George W. Craddock, is chief of the Division of Forest Influences Research, Intermountain Forest and Range Experiment Station.

We have been hearing much of late about this vast acreage of Federal lands in the West. Suggestions have been made to reduce that acreage or eliminate it by passing the lands into private ownership or to the states. Some people dissatisfied with the public-land situation are not interested in outright ownership but want more freedom to use the resources of the land.

The motive behind these proposals could be purely selfish. It could be a natural reaction against the public control and regimentation we experienced during the war and depression years. It could be a resurgence of our traditional belief in free enterprise. In any event, growth of the population and the great movement of people westward has created extraordinary demands for the resources and services of the lands and has centered attention on them for exploitation purposes.

We must face the fact that the value of our western public lands has in recent years greatly increased. They have upon them sizable stands of virgin timber. Though much of this resource is on remote and rugged mountain land, the demand for lumber has become so great that loggers are willing to build expensive access roads to get it out. Species that were considered inferior and unmerchantable a few years ago now find a ready market. Ironically, individuals and corporations who once ignored or passed up the chance to acquire some of these forest and range lands before they were placed in the reserves now look longingly at them.

The demand for the forage resource on the western Federal lands reached a saturation point many years ago and today it is virtually impossible to find an acre of virgin range. But the demand for range forage continues in ever-increasing force, so much so that graziers have long since placed premium values on their public-land grazing permits. Many consider themselves lucky to be able to graze their herds and flocks on depleted ranges which now produce little more than the exotic cheatgrass and Russian thistle.

The western public lands embrace most of the choice recreation areas and are the home for the great bulk of the wildlife population. Last year 18 million people visited the national forests, and another 10 million visited the major national parks of the West. For the country as a whole, the number of hunting licenses has quadrupled since 1919 and the number of fishing licenses has trebled since 1933, further indicating the growing demand for outdoor recreational opportunities.

The most valuable resource derived from the western public lands is water. All of the major rivers of the West, such as the Columbia, Missouri, and Colorado as well as virtually all of the smaller streams have their source on high-elevation, humid mountains and plateaus within the national forests and parks. Thus far the Federal government has invested about 2-½ billion dollars in structural works to make these waters available for irrigation on some 25 million acres of irrigable lands in the 17 western and plains states. This is but a start. The rapidly growing West is faced with needs for still more water for irrigation, power, industry, and for growing cities and towns. To meet these needs will necessitate the planning and underwriting of elaborate water developments that will cost many more billions of dollars in order to make water available where and when it is needed.

The growing demands for the timber, forage, wildlife, recreation, and water call for the best possible wildland management. There is now greater need than ever before for proper land use and an equitable balancing of the multiple resource uses involved.

These uses must be based upon technically sound considerations of the hydrologic as well as the productive limits of the land. No one would think of building or living in a house that would not withstand the impact of the heaviest wind and the weight of the heaviest snow. We expect our houses, our bridges, and our dams to be adequately designed and safely built.

The land also has definite limits of use beyond which productivity declines, accelerated erosion sets in, and the usefulness of streamflow diminishes. These limits of the land to produce timber, forage, and wildlife and to maintain normal stability of the soil and specific characteristics of streamflow are not economic. They are physical and biological phenomena which operate without regard to market values.

The uses of our forest and range lands must also be based upon a philosophy of the greatest good to the greatest number in the long run. Consideration of the future needs is especially important because the intense interest in the public-land resources being shown today is but a forerunner of greatly increased demands and needs for those resources which will surely face us tomorrow.

The Genesis of Conservation

The modern concept of conservation—sustained availability of soil and water resources with use—was born in the West about 60 years ago. This conception came slowly but inevitably out of a realization that our young nation had been wasteful of its resources, especially timber and soil, and that public action was necessary to stop abuse of the lands and to restore and maintain their productivity and usefulness.

Beginning in 1781 our newly founded Federal government set out to make this a mightly nation by acquiring land and by making those lands available for settle-

ment and exploitation. Some 200 million acres of undeveloped land were obtained from the original states. Huge tracts of western lands were added to the public domain by purchase and cession, bringing the total acquired area by 1850 to about 1.2 billion acres. Concurrently with this land acquisition program, law after law was passed to make the land and its resources available for homesteading, mining, lumbering, and grazing. Large tracts were also granted to canal and railroad companies to encourage transportation improvements and to states for the support of education. Since 1850, disposals have exceeded acquisitions and today our public-land holdings total about 400 million acres.

Until recent years, our land laws reflected an open-handed land policy. In the rush to the West, individuals and companies were quick to seek out the best lands. Nobody wanted the poor lands, the inaccessible timberlands on steep and remote mountains, or the sparsely covered desert valley lands, even at nominal cost. Purchase of the latter was in fact unnecessary because there was no effective provision for protecting or supervising the remnants of the public domain. Trespass and virtually uninhibited use of the remaining public lands became common practice.

Our early land disposal laws brought both good and bad results. They fostered a quick settling of the West and made available the timber, the minerals, and other products of the soil that were needed by a growing nation. They also permitted waste and depletion of the resources on a wholesale scale. By 1890 our nation was both richer and poorer. It was richer in people, farms, factories, railroads, schools, and churches. It was poorer in reserves of timber, forage, and wildlife, in acres of stable soil, and in the regularity and clarity of streamflow.

Some far-sighted citizens eventually awakened to the need for stopping abuse of the remaining public lands. An early step made by the Federal government in the direction of conservation was the passage of an act by Congress in 1891 which gave the president the power to establish forest reserves from the public domain. The first reserve to be set aside under this act was the Yellowstone Timberland Reserve in Wyoming. Additional reservations followed in Colorado, California, and other western states.

The Forest Reserve Act in its broadest sense was an expression of national concern about our public-land resources and the prevailing liberal give-away land policies. The need for a land policy was being felt which would provide for the protection of the remaining resources on the public lands, for the restoration of those lands that had been abused or overused, and for the maintenance of their productivity so they could continue to serve the communities, industries, and railroads which had become dependent upon the public-land resources.

Figure 2. Much of the nation's remaining virgin timber is located on the western public lands—much of it on remote and steeply sloping mountains. The manner in which timber is harvested from these watershed lands is not solely the concern of the logger. The public which has already invested many millions of dollars in major downstream water conservation, flood control, and hydroelectric projects also has a direct interest in maintaining satisfactory watershed conditions on the publicly owned forest lands.

There continues to be much interest in Federal land acquisition and disposals, especially in the West. One gets the impression from news stories that the Federal land holdings have greatly increased in recent years. Insofar as the 11 western states are concerned, the Federal government during the period 1933 to 1950 acquired not to exceed 7.0 million acres of land but also disposed of 7.4 million acres, thus bringing about a net shrinkage of Federal land.

The recently disposed lands went into private and state ownership under the various grant, patent, and purchase provisions of the land laws. The acquired lands were obtained under various national programs for defense and for soil and water conservation. Much of the acquired acreage was needed for bombing ranges, atomic energy plants, and other military functions. Included also were abandoned dry farms, cut-over and burned forest lands, depleted rangelands, and deteriorated watersheds which were placed under Federal ownership and administration because they had proved to be submarginal under private ownership.

Contributions to Conservation Principles

If the birth of conservation as we have come to know it today can be ascribed to any single action, credit must go to the act of June 4, 1897. This act, with later amendments, provided the general authority under which the present national forests are administered. It outlined a system of organization and management for the previously established forest reserves. Moreover, it au-

thorized the hiring of employees to protect and administer the forests and made possible the opening of the reserves to use. The concept of resource conservation with use was thus born—a concept that has become the cornerstone of every modern conservation program.

The creation of the national-forest system was the first large-scale Federal attempt to place wildlands under management. It continued to be the only major conservation effort for more than 30 years when, in 1934, the Taylor Grazing Act placed a large portion of the remaining public-domain lands under management. In the same year the Soil Conservation Service was authorized by Congress.

When our present national forests were first organized, forest officers were charged with the dual responsibility of protecting and permitting use of the land resources. In many places they found the forest lands overgrazed, burned, and no restocking or restocking so slowly as to be of no commercial use for many years. Out of this situation, with growing demands for timber and forage on the one hand and with a diminished supply of these resources on the other, came the necessity for limiting timber cutting and grazing to the capacity of the land to maintain its productivity in perpetuity. This objective of sustained yield has come to be recognized as a fundamental and vitalizing concept in conservation.

The law which set up the national-forest system provided for the maintenance of conditions favorable to streamflow as well as for the preservation of abundant timber supplies. There was in fact more concern over the increasing destructiveness of floods in some parts of the West, as in southern California and Utah, than there was over the timber resource. Observational studies of floods in those areas led to recognition of the fact that the land performs important functions in the disposal of water and that those hydrologic functions are influenced by the condition of the plant cover and the soil mantle. Watershed protection was thus added to sustained yield management and both have long since become companion goals in conservation.

With development of the national forests there came recognition of the importance of wildlife resources and of the recreational values of wildlands. Demands for these resources as well as for timber, forage, and protection against floods compounded the complexity of the management job. Management required integrating timber harvesting operations with livestock grazing, livestock grazing with game management, and all of these uses with requirements for recreational use and for watershed protection. There was thus developed a third important conservation principle: that of multiple resource use.

Contributions to Conservation Education

When the first forest officers assumed their responsibilities they were faced with problems of putting out fires, of selecting and marking trees for cutting, of inventorying the forage resource, and of building roads and trails into remote areas so the timber and forage resources could be utilized. These needs were explained to the Congress and recommendations were made for appropriations to carry out the protection, development, and management work. Similar explanations and requests have been taken to the Congress every year for more than 50 years. Out of this process has come an ever-widening recognition of the values at stake on the national forests and of the need for effective protection and management facilities. This recognition, pioneered as it was by a handful of early foresters, no doubt also paved the way for congressional recognition of the need for getting management on other public-domain lands, for enlarging and improving our public recreation areas, and for the development of public wildlife refuges.

From the time the national forests were first opened for use, the equitable distribution of their resources among permittees has not been a simple problem nor is it any more simple today. Education was early recognized as the main element in the solution. Through frequent meetings, local forest officers kept the forest users informed regarding the kind, amount, and condition of the available resources and encouraged the development of local resource-user groups whose judgments were solicited in working out conflicting demands. Thus was born the counterpart of many of our present-day resource-user advisory groups.

The people who lived in communities beyond the forest boundaries were concerned about floods and sedimentation, about recreational opportunities, about hunting and fishing. The relations of these resources and services of the national-forest lands to problems of fire control, of good forest management and range management were explained to the public at large. It is difficult to assess the value of these educational contributions to conservation. But certainly the long-standing campaign to prevent forest fires, in which the states were co-pioneers and have since actively participated, and the continuing educational efforts about the importance of watershed lands have been potent forces in keeping the public conscious of the need for conservation.

Out of this need for public education about the importance of the nation's forests, the American Forestry Association was organized. The programs of that organization over the years have done much to advertise and advance forest conservatiton.

The early foresters, faced with an almost infinite va-

riety of plant, soil, water, and land-use conditions, had to make decisions for which there was very little technical knowledge. They knew they had to learn quickly and to profit from the experiences of their colleagues. To meet this need, shortly after the turn of the century, Gifford Pinchot gathered a small group of technical foresters together and organized the Society of American Foresters. A profession was thus born some 50 years ago—a contribution which led to the creation of other technical societies covering many phases of conservation.

There was also an obvious need for more knowledge about our wildlife resources and for more foresters and other trained technicians. To meet these needs, schools of forestery were added to many of the leading universities and colleges and the scope of teaching has been broadened to cover all phases of wildland management. Many of the graduates of these technical schools have devoted their lives to a career in wildland management and have greatly furthered conservation on private as well as public forest and range lands throughout the nation. This year (1953) as many members of the Society of American Foresters are employed by industry as there are by the Federal government.

Figure 3. The forage produced on the western public rangelands is a vital link in the year-round feed supply for millions of cattle and sheep. Use of the forage resources on these lands by domestic livestock must be balanced and coordinated with the food requirements of big game, with demands for recreational use, and with watershed protection requirements. These multiple public interests can be safeguarded only by public land management.

Contributions from Wildland Research

The development of the national-forest system did more for conservation than to initiate management of the national-forest lands. It led also to a program of research into the scientific facts and principles essential for improving management, not just for national-forest lands, but for forest and range lands in all ownerships.

Early forest administrators, faced with problems of handling land areas of great physical and biological complexity, sensed the need for research help and a branch of research was organized in the Forest Service and scientists were put to work to provide answers. I shall mention the contributions of wildland research to conservation only summarily; they have filled many books and have reached into every phase of wildland management.

We have gotten an increasingly better knowledge of our forest resources, of forest growth and drain, as surveys have gone forward and new and more efficient survey methods have been developed. Research has determined silvicultural requirements of a number of forest types and cutting practices to insure maximum sustained production. It has tackled the problem of getting natural regeneration in forests, of artificial planting in cut-over areas and burns that are now brushfields, and, on the other hand, of stepping up production in crowded, stagnated stands. It has contributed to a knowledge of fire behavior, detection, and control, and has developed methods of coping with certain forest insects and diseases.

Range research has tested methods of grazing management to improve forage and to check erosion where native plant cover has been damaged by overuse. It has brought to light facts about the forage requirements of wildlife from which we hope to strike a proper balance between wildlife and livestock use. It has developed criteria by which the land manager "reads the range," evaluating its condition and learning whether it is getting better or worse. It has developed methods of getting rid of undesirable species and methods of artificial seeding; and it has introduced and tested new plants that have proved their value or that hold great promise for conservation, both as forage and for controlling erosion.

The fact may seem strange to us now that the watershed value of forests was a subject of very live controversy 50 years ago. Watershed research has established many of the relations between vegetation, erosion, and streamflow—and not only for timberland, but for brushland and grassland as well. This research has demonstrated that all vegetation, even low-growing herbaceous plants, plays an important role in the reception and disposition of water on each part of the earth's surface on which it grows. It has demonstrated the relations that exist between the uses made of wildlands and their ability to control water and erosion, and it has made a start in establishing cover requirements of safe use.

But going beyond any single field, it seems to me that research has made its greatest contributions in the de-

velopment of basic concepts. One of these is a growing appreciation of the interrelatedness of plants, animals, soils, and water—a growing appreciation of the functioning of each tract of wildland, be it covered with pine trees, sagebrush, or grass, in its disposal of rainfall and snowfall, in its production of cellulose, and in its protection of soil. Such an appreciation forms the solid foundation of true conservation.

The scientific and technical knowledge that has been accumulated during the past half-century as a result of research, and the land management conservation concepts that have grown with it, have been disseminated far and wide. Much of the research on forest and range problems has been done by Federal agencies, notably the Forest Service Branch of Research and the Soil Conservation Service. In planning, designing, and carrying out studies in the field, however, the scientists working on the problems of wildlands have drawn heavily upon the fund of basic knowledge developed in the laboratories of universities and colleges and in the work of such other Federal agencies as the Weather Bureau and the Geological Survey.

The Job Ahead

The western public lands have an important future contribution to make to conservation. That contribution is to satisfy to the extent possible under enlightened management the demands which will be made upon them for increasingly greater quantities of wood and forage, for more abundant wildlife, for more satisfying recreational opportunities, and, above all, for more clear and regular yields of water.

A big rehabilitation job must be done on our western public lands if these goals are to be achieved. Much of the forest land is known to be growing timber at a level far below its potential. At least half of the rangelands are known to be greatly depleted. Practically all of our public recreation areas and facilities have suffered from lack of maintenance and development. Moreover, and with alarming consistency, survey after survey in recent years has shown that all too many of the western watersheds are in unsatisfactory condition from the standpoint of controlling storm runoff and erosion.

The reconditioning of the public lands will be a costly job. It will involve many difficult adjustments in grazing use and timber harvesting so that natural revegetation and soil stabilization can go forward. It will mean intensified fire protection in many places. Severely depleted lands will have to be planted or seeded. Rapidly eroding areas will require supplemental structural measures to control runoff and keep soil in place. The cost of these improvements in most instances will be compensated by increased or better-quality crops of trees and forage. In some places, however, the cost of improvements will be justified in terms of benefits to society, such as increased watershed protection values.

Rehabilitation is only half of the job ahead. If the western public lands are to serve the nation in the future they must be managed in such a way as to get the maximum possible use of the land resources without upsetting the capacity of those lands to yield useful streamflow. Through trial and error and by carefully controlled experiments we know that the capacity of our wildlands to withstand disturbance is indeed delicately balanced.

We know now that the manner in which timber is cut and logged on the headwater slopes in Idaho and Wyoming is not solely the concern of the timber operator but is of concern also to the public which has an interest in maintaining the useful life of the multiple-purpose reservoirs on the Columbia River in Washington and Oregon. Similarly, we know that the manner in which flocks are grazed on the high plateaus and the lower benchlands of Utah it not solely the concern of the grazing permittee because just a little overgrazing can set in motion accelerated erosion processes and sedimentation that can doom downstream communities which are dependent upon water storage reservoirs. In short, the public has such a great stake in the continued yield of water from the public lands that the far-reaching ecologic and hydrologic changes which can be set in motion on those lands should not be left to chance.

We have witnessed and can expect to see more conflicts in the demand for the resources of the western public lands. A public agency which is charged with the responsibility of conserving the soil and water resources, is equipped with technical knowledge, and is free from local pressures can most effectively adjust the land uses and integrate them in the public interest.

Conflicts are also bound to arise among timber operators, graziers, sportsmen, recreationists, and water users in local areas. Here, again, the arbitration of these conflicts and the equitable spreading of the available resources among users can best be done by a government agency which is in a position to analyze the needs of whole communities.

The job of restoring and keeping the western public lands in a healthy condition is a real challenge to conservationists. They can do that job by continuing and strengthening the application of the fundamental principle of conservation which have been developed from research and experience in handling those lands. They will see to it that all of the resources and services of the lands are developed and utilized—but utilized in such a way that the lands will continue to serve the nation in perpetuity.

Water Rights and Our Expanding Economy

C. E. BUSBY

Water is a principal limiting factor in our expanding economy, based as this economy is upon initiative and resourcefulness of a free and independent people. We are finding that our old common law principles for water use are ill adapted to modern needs wherein water shortages are becoming more prevalent.

But changes in legal systems usually come slowly, depending upon the rate at which key individuals in each state are willing to make the necessary determinations. Leaders in organized soil conservation districts have recently taken the initiative to work with other water using groups to accelerate desirable adjustments in existing water laws. This grass roots movement started in South Carolina in 1952. It may have far reaching implications for the future in view of the importance in meeting our water needs. Two additional articles covering the various aspects of water law will appear in subsequent issues of the Journal.

C. E. Busby

DURING AND SINCE World War II, the people of some of our states have experienced a considerable expansion in the use of water by agriculture, industry, and towns and cities. This has occurred within the seaboard states from the Canadian border around to the Gulf of Mexico and including the states of Arizona and New Mexico. It has taken place at certain inland points as well.

Coupled with this expansion in water use have been droughts and reduced stream flow, continuing pollution of stream waters, and lack of storage, conveyance, and other works for water development and use. These factors, often occurring together, seem to have created local shortages of good quality water during critical periods. Competition and conflicts of interests have arisen as a result, especially during periods of great water demands and of limited supply.

Conflicts of interest over water are not new by any means. They have been present in our western states from the early American occupation. Even in the East, where problems arising from excess water seem to have predominated in the past and where local shortage problems are more pronounced now, early decisions of the courts record conflicts over water which arose because of droughts and temporary detention of streamflow.

Problems of excess water lead to conflicts of interest too, especially where attempts are made to alter by artificial means the movement of water over the land and in the stream channels. Both shortage and excess problems often occur in the same locality, especially where pronounced seasonal variations in rainfall occur and rapid industrial and agricultural developments are taking place.

Some of these conflicts lead to court action or legislation. But some do not. Nevertheless, they may have adverse affects upon the water phases of soil conservation programs and the general economic development of the localities in which they arise. They should be dealt with promptly and effectively. Of course, they cannot be eliminated completely, But, through the application of the right combination of vegetative and structural measures in community watersheds and of legal and administrative systems, they can be reduced in number, their adverse affects minimized, and water use and management facilitated. Often, the legal and administrative aspects must be handled first. It would seem to be important for state leaders to look ahead in developing solutions for these problems so as to provide up-to-date adjustments before conflicts over water become more acute.

These matters are important to soil conservation districts. The intensive use and conservation of lands through irrigation, drainage, and flood-damage prevention, and the provision of water supplies for livestock, recreation, and other uses in rural areas, call for systematic development and management of ground water supplies and streamflow, and also for retardation of the movement of diffused surface waters over the land and in minor drainageways.

District supervisors cannot solve all these matters, working alone. For this reason, they are taking the lead-

C. E. Busby, a member of the SCSA, is soil conservationist for the Soil Conservation Service with headquarters in Berkeley, California. He is also a member of the District of Columbia Bar.

ership in some states to determine in cooperation with other water using groups: (1) What are their existing systems of water law and administration? (2) What do these systems mean in terms of the modern needs of farmers, urban communities, and the several states? (3) What should be done now and over the years to bring these systems in line with the best accepted principles of water law and administration and with local needs?

Questions of this type concern not only farmers and soil conservation district supervisors. They are also of vital concern to people in towns and cities, to business and industrial leaders, and to the recreation groups, as well. Fortunately, through the Program for Greater Service of the National and State Associations of Soil Conservation Districts, these nonfarm folks are coming to understand and appreciate more fully that the manner in which water and land are used and managed in community watersheds determines, in part at least, the extent to which residual runoff and streamflow from these areas may be used farther downstream, or floodwater and sediment damage caused by it can be avoided. Thus, a community of interest among farm and nonfarm folks affords a basis for cooperative effort in developing or improving water law and administrative systems.

It is the purpose of this paper to examine in a general way our existing systems of water law and administration, with special reference to the policy aspects and what needs to be done to establish more adequate water policies and means for their implementation; and to outline briefly how Soil Conservation District supervisors, State Soil Conservation committees, Joint Legislative Advisory committees, and other organized groups and agencies are approaching the solution of these problems along traditional democratic American lines. The approach employed by these people might be termed a "grass roots" effort, in which district supervisors and other leaders are applying in a broader field their experience in conservation and local self-government. They are also carrying out their desire to work with, and be of assistance to, other water-using groups and all the citizens of their respective states.[1]

Systems of Water Rights and Administration

The system of water rights and administration in effect in the eastern states is markedly different from that in the western states, where every phase of human and business activity has always been dependent directly or indirectly upon water.

These systems differ sharply from the standpoint of three basic policies: (1) the emphasis placed upon beneficial use and conservation of water, (2) the emphasis placed upon security of and encouragement for investments in water development and use, and (3) the emphasis placed upon statewide and local administrative responsibility for guiding water development and use. All three basic policies are emphasized in the West. But they are not so emphasized in the East. Here lie some of the most vital questions of policy which should be examined and considered in the eastern states.

The Use and Damage Aspects of Water. Water problems, programs, and systems of law and administration may be considered in terms of two broad aspects—the aspect of *use* and the aspect of *damage*. There are consumptive uses, such as for domestic purposes, livestock, crops (especially under irrigation), and industrial purposes. There are also non-consumptive uses, such as for fishing, hunting, cooling, power, and navigation. Of course, these types of use are not mutually exclusive in every case.

Some of these types of use, such as for domestic purposes, have always been looked upon as natural ones. Others, such as for irrigation purposes, have been looked upon as artificial ones.

The damage aspects of water consist of damage caused by water, such as erosion, flooding, "sobbing of the soil," and sediment deposition on the land; and damage caused to water, such as by human and industrial wastes, salt encroachment, and sediment suspended in the water itself. In certain respects, high temperature is also a factor of damage. These damage aspects often arise by reason of unwise use and poor management of water and watershed lands.

All too often these basic aspects of water, which grow out of its essential and dynamic character, are not clearly distinguished. Sometimes they are not easy to distinguish clearly because they may be bound up together in the same local area. But it is important to keep them in mind, for we are dealing here with rights of water use and rights to be free from water damage. This paper will deal mainly with the use aspects.

Water Law and Administration in General. The subject matter of water law and administration may be broken down into basic property rights and organizations. Water in its relation to the land is considered in law to be real property, until the water is taken into possession. Then it is considered personal property in most states. Different rules of law apply to the two classes. Personal property rules will not be considered here.

Organizations are either public or private in nature. There are public agencies at the state level, such as Pollution Control Boards, and Public Utility and Securities

[1] It is a source of real pleasure to have the opportunity to work with and serve these outstanding American citizens and their associates. They ask nothing more for their time and effort, given without the slightest thought of personal advantage, than the opportunity to be helpful to others. This unselfish devotion to the welfare of all should receive the sympathetic support and confidence of the American people.

Figure 1. Water is a principal limiting factor in our expanding economy, based as this economy is upon initiative and resourcefulness of a free and independent people.

Regulating Commissions. There are also public agencies at the local level, such as irrigation, drainage, flood control, water supply, and other districts. Soil Conservation Districts have certain water responsibilities as well, especially with respect to diffused surface waters.

Then there are corporations, partnerships, and other private organizations concerned with water development, storage and sale. There is not sufficient time nor space here to take up the organization phase of this subject, except as it bears upon the general subject of administration of rights and development.

Thus, the remainder of this part of the paper will be confined to principles of water rights and administration, and their meaning. It has three broad subject-matter fields—rights to water in the air, rights to water on the ground, and rights to water in the ground.

Rights to Water in the Air. At present, no property law dealing specifically with rights to the use of water in the air has been spelled out. That does not necessarily mean that there are no such rights. It has been said that there may be natural rights to these waters by reason of the ownership of land.

When one buys a farm, there usually are several factors which make the purchase of that farm attractive and which go to make up the consideration for the purchase price. One of these is climate. Water in the air is essential to farming enterprises, especially non-irrigation farming. Otherwise, these enterprises would have little value. Consider, for a moment, the desert areas which may obtain two inches of rainfall a year and which have an enormous evaporation rate. Land in such an area has little value without water. These factors might be considered in determining whether or not and to what extent, if any, farmer have rights to use the water in the air.

Why bring up this subject if there is no existing law on the subject? Simply this—artificial rainmaking is taking place in the West in connection with ranching activities and the firming up of power-producing water supplies. It has also been extended into the eastern states, such as Louisiana and Mississippi.

Bills have been introduced into Congress to provide for federal regulation. A few states have recently passed legislation to provide state regulation. Apparently the New York legislature recently passed such a bill, but Governor Dewey vetoed it for specific reasons.

It would seem that, since there is little public policy in this field, the state legislatures and Congress should be giving consideration to the matter before artificial rainmaking gets out of hand. Farmers and Soil Conservation District supervisors need to be thinking about the problem, too, for it is of concern to them.

Rights to Water on the Ground. Rights to water *on* the ground are divided into those which concern waters in well-defined stream channels, and waters not in well-defined streams. The latter are called diffused surface waters by some writers, and surface waters by most of the courts. "Diffused surface waters" would seem to be much more descriptive, and less confusing with stream waters.

One of the first systems of water law having wide and material influence upon America was the Code Napoleon of France adopted there in 1804 and in Louisiana a few years later. This system emphasizes the concept of equality of right and use of the supply in common among those who are especially entitled to it. In fact, this was later referred to by American jurists as "perfect equality of right." It may have been an outgrowth of the French revolutionary movement, in which the concept of equality played such an important role. It is quite a contradiction that the so-called equality of right

of use was restricted to those people owning lands which touch the banks of each stream.

But doesn't the idea of perfect equality sound just a bit Utopian and impractical? How can those land owners have a perfect equality of right to use a stream with all its natural variations in flow, unless the supply is in excess of need at all times or only limited uses are being made of it? Let's see what this civil law system is composed of and what it means from the standpoint of modern artificial water uses.

Under the Code Napoleon, he who owned lands touching upon a stream was entitled to have the full flow come by his place undiminished in quantity and unimpaired in quality. This means that no one could make much use of the streamflow, else it would interfere with the equal rights of others similarly situated downstream. Under this policy, one in the lower reaches of a stream —who could demand the full flow of the stream—could monopolize much of the water supply above him. Furthermore, one whose lands did not touch the stream could not use it at all. Over the years, the total acreages of land holdings which touched the stream and were entitled to a water supply were reduced by reason of the sale of back tracts or their distribution among heirs of the original grantees.

To a considerable extent, therefore, it was a non-use and monopolistic policy when we consider the needs and requirements of the people, lands, and industries needing water in any given area. It may have been adequate to the needs of the continent of Europe in the early 1800's, when limited uses were being made of streams largely for domestic and other natural purposes under a simple type of economy. But it is not adequate to our modern needs, where artificial uses are so important in an expanding and complex economy. We need to examine this question at some length.

Of course, America had its own revolutionary movement, too. You will recall that your ancestors and mine did not feel very kindly toward the English during and immediately after the Revolution. But they did like the French, who helped win our independence. This attitude carried over into the field of law. In fact, the legislatures of three of our states—Kentucky, New Jersey, and New Hampshire—refused to permit their courts to rely upon English decisions during that period. As a result, there was a turning away from the English to the French legal system.

Two of our great American jurists, Justice Story and Chancellor Kent, were in the forefront of this change. These men were masters of the French language, so could go directly to the original French sources. Here is how they came upon the Code Napoleon, we are told.

But Story and Kent identified at once the non-use and monopolistic policy of the Code. They considered it inadequate to the needs for water in the economic development of a new and growing nation. They thought the broad concepts of the system might be useful, however, if they were modified somewhat to permit greater use of water. So they added the famous rule of reasonable use, with the thought that this would cure the deficiency. This rule holds that one may do about as he pleases with his property, just so long as he doesn't injure others. Let's see what this change in the Code meant in terms of broad policy.

The System of Riparian Rights to Streamflow

Under the new riparian theory, spelled out by Story and Kent, one who owned lands touching upon a stream was entitled to have the full flow of the stream come by his place undiminished in quantity and unimpaired in quality (Code Napoleon), except that each landowner was entitled to make reasonable use of the water upon his own lands, provided: (1) that he returned the stream to its natural channel before it left his lands, so as not to deprive succeeding lower riparian owners of their rights, and (2) that use on his own land was reasonable in respect to the corresponding rights of other riparian owners lying below him (rule of reasonable use).

Thus, this permitted some use of water for lands touching the stream, but mainly for domestic purposes. This tended to reduce the non-use and monopolistic aspects of the old policy. But the limitation regarding the natural rights of use of lower lying riparian owners tended to lock up in a non-use reserve much of the streamflow in its upper reaches to satisfy the natural flow rights of the lower-lying owners if and when they might desire to use it—though they need never use it if they were not inclined to.

To this extent, the new policy was also a non-use and monopolistic one—especially from the standpoint of the needs of non-riparian landowners. However, this aspect of the system was not fully recognized for many years until it came in for court and administrative tests in the western states, where the policy had been adopted when some of those states were admitted to the Union. We shall examine this development later.

Each of the 13 original states adopted the common law of England too, early in its colonial history—for example, Virginia in the 1600's and South Carolina in 1712. Of course, at that time there was no real "system" of water law in England or the Colonies, so the Colonies could not very well have adopted much by this means. Nevetheless, beginning in 1833 and then decisively in 1849, the English courts adopted the new riparian concept into their common law through the influence of

Figure 2. The intensive use and conservation of lands through irrigation, drainage and flood-damage prevention call for systematic management of all waters.

Story and Kent. By this time there had been a swing back again to the English courts for guidance, and, in fact, the English courts by that time took some of their guidance from our jurists. So the courts of most of the states, thereafter, adopted the new riparian law.

It should be pointed out that this riparian system was entirely court-made law. Its development in each state was limited to the narrow issues coming before the courts. It did not emphasize beneficial use and conservation, for it made little difference under this system whether a riparian landowner used the water or not, in so far as his continuing rights of use were concerned. This is what Judge Shenk of the California Supreme Court has called the rocking-chair theory of water rights. One could sit on his porch and rock back and forth while watching the water flow by but never use it unless he chose to do so. Though he makes no contribution to the welfare of his community by this failure to use the stream, he may keep his rights forever.

Furthermore, the system placed little emphasis upon the protection of rights to supplies when these were short of the needs of all. The right did not relate to a specific quantity of water at a given time or place upon which one could base his claim. When shortages develop, each riparian owner must share in the shortage as he might in the plenty. As the shortage becomes acute and there isn't enough for anyone, all riparians must suffer long before the supply actually runs out, much as people suffer when the pumping of ground water becomes economically impracticable long before the water table drops to the base of the reservoir.

In addition, under this court-made law, the executive branch assumes little or no administrative responsibility for water development and use. Thus, there is little opportunity for the state to guide development and use along sound lines consistent with water and related land capabilities. We must not forget that once water developments take place, they are considered valuable property rights. It is very difficult to make changes in their use aspects once they become legally established.

These several policy aspects seem to be the main limitations upon the riparian doctrine. Each will be discussed further in terms of Western experience, where the riparian system has been subjected to more intense testing than in the eastern states where it predominates. However, we must now turn our attention to the western system of prior appropriation, which grew out of the necessity for a policy which would permit a more practical and equitable distribution of the limited water supplies of that vast semi-arid land. We shall then see how and why beneficial use and conservation, security for investments, and administrative responsibility for development and use are so important to artificial water uses in a modern, complex and expanding economy.

NOTE: *The second part of this article will appear in the May issue of the* JOURNAL. EDITOR.

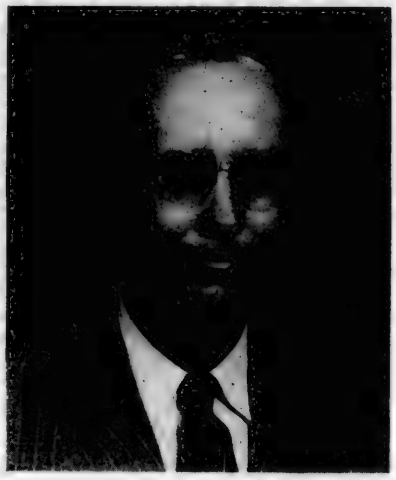
Figure 3. Reduced stream flow, droughts, pollution and other factors have often created local shortages of quality water.

Effectiveness of Cover in Reducing Soil Splash by Raindrop Impact

BEN OSBORN

Range vegetation and farm crops offer within themselves the means of protecting from erosion the land on which they grow. Successful conservation farming or ranching requires sound judgment of how closely to harvest these crops for their economic returns, and how much of the growth to leave for soil protection. To help answer this question of "how much is enough" was the aim of the field evaluations reported here.

This concluding article, the third in a series of three, reports measurements of the protectivity of plant covers, as a separate property of the cover itself. They indicate that all kinds of cover tested were capable of providing essentially complete protection from raindrop erosion. Seasonal development of cover, and differences in management and harvesting, influenced relative protectivity more than did the kinds of plants involved. The art of soil conservation, then, lies largely in matching the production of cover and the season and degree of removal to the erosion hazards inherent in the soil and the rainfall pattern of each site and locality.



Ben Osborn

THE IMPORTANT ROLE of the energy of falling raindrops in the erosion process has been discussed in a previous paper (4) as a primary force in detaching soil particles and making them available for removal by surface runoff. The amount of erosion is a function of the erosivity of the rain, the erodibility of the soil and the protective effect of covers.

The extent of soil splash on bare ranges and croplands, under a standardized artificial application of water equivalent to a hard thunder shower, has been measured under a wide variety of field conditions in the Southwest (5). These tests showed that two inches of rain might detach and set in motion as much as 80 tons per acre on range or pasture land, and in excess of 110 tons per acre on croplands. This material is readily available to be carried away by runoff. In many field situations it constitutes a major part of the potential erosion hazard.

Plant cover, which intercepts the drops before they strike the ground, neutralizes the storm's energy and thereby reduces soil detachment and movement. Field evaluations of the effectiveness of different kinds and amounts of cover in protecting the land from raindrop impact were conducted by the Operations and Research branches of the Soil Conservation Service in the Western Gulf Region. Results show that effective control of erosion resulting from raindrop impact is possible on all soils, and indicate the amounts of cover required for different degrees of protection.

This is the last of a series of three articles on the soil-protective values of range and cropland cover. The author is soil conservationist, Soil Conservation Service, Midland, Texas. He is a member of the Soil Conservation Society of America.

Measuring Effectiveness of Cover

A mobile raindrop applicator was used to subject 12-x 18-inch plots of different kinds and amounts of cover on the same soil to a standardized application of water. A comparison of the soil splashed from the plots by this test indicated the relative effectiveness of the different examples of cover.

A mathematical rating of the effectiveness of the cover was obtained by comparing the amount of soil splashed on a plot with cover to the calculated amount which would have occurred on the same soil without cover (6). This was made possible by determining the detachability rating of the soil from core samples of the sample area by the splash method (5) and calculating the potential splash from bare soil.

The extent to which the cover reduced the splash was then calculated by comparing the actual splash measured on the field plot, with cover in place, to the calculated potential. This was expressed as a percentage as follows:

$$\text{Effectiveness} = \frac{\text{Calculated splash from bare soil} - \text{Measured splash with cover}}{\text{Calculated splash from bare soil}}$$

This made possible the comparison of all samples of cover, regardless of the character of the soil on which they occurred, and relating their effectiveness to measured or observed properties of the cover itself.

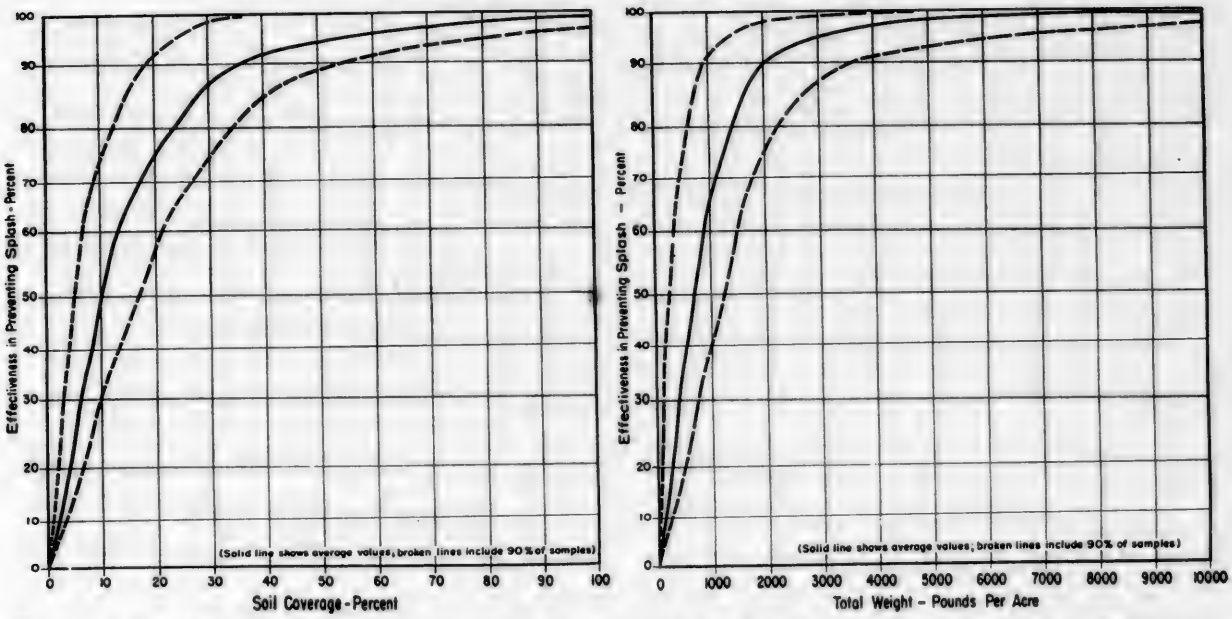

Effectiveness in Preventing Splash - Percent
Soil Coverage - Percent
(Solid line shows average values; broken lines include 90% of samples)
Effectiveness in Preventing Splash - Percent
Total Weight - Pounds Per Acre
(Solid line shows average values; broken lines include 90% of samples)

Figure 1. *Left.* Effectiveness of range cover in preventing soil erosion by splash in relation to soil coverage. *Right.* Effectiveness of range cover in preventing soil erosion by splash in relation to total weight.

Classifying and Measuring the Cover

Before the cover on each plot was disturbed by the test, it was carefully described as to species composition and density, and photographed from a vertical viewpoint. A white ruler, inserted beneath the cover alongside the plot in such a way that the exposed portion would show in the photograph, made it possible to measure the degree of soil coverage (2).

After the splash test, the standing cover was clipped at ground level and the litter was collected from the plot. This material was air dried and weighed. On range plots, the height of the cover was measured at 50 points by means of a point quadrat counter.

Range cover sample areas were classified as to condition class and degree of use by standards in general use by range conservationists in the Western Gulf Region of the Soil Conservation Service (8). A frequency tally was used to determine approximate composition and utilization by species within a sample area (3).

Range condition classes were recognized strictly on the basis of the percentage of the present composition comprised by species which make up the climax vegetation on the site (1). Four classes were defined as follows: Excellent, 75-100 per cent climax vegetation; good, 50-75 per cent climax; fair, 25-50 per cent climax; and poor, 0-25 per cent climax.

Degrees of use were determined by the weighted average percentage of the current season's growth of climax and dominant species removed by grazing, as found by the frequency tallies. Three degrees were recognized: Unused, none or negligible; light, less than 50 per cent; and heavy, more than 50 per cent.

Effectiveness of Cover

The effectiveness of cover in preventing soil erosion by splash is proportional to the amount of cover present at the time the rain falls. Both the thoroughness with which the land surface is covered to shield it from the drops, and the weight or bulk of the cover present to absorb the energy of the rain, are important.

So important is *amount* of cover in providing protection from raindrop impact that, when the results from all the plots of either range or cropland were plotted together, this factor outweighed the wide differences in type or species of vegetation, range condition, degree of use, kind of crop, or other variables included.

Regardless of whether results from a single site, or from all sites combined, were compared, the *effectiveness* of cover in reducing soil splash increased as the *amount* of cover increased until essentially complete protection was provided. Beyond this point, additional cover could have no further effect.

Differences in the growth form of the cover had some influence on its effectiveness, giving different results when some individual species of range cover or crops were compared. These differences result mainly from different quantities of cover produced by different species and from differences in its arrangement over the ground surface. In range vegetation, the effect of individual characteristics of different species was generally lost in the mixtures that make up range types.

When results from all range plots, regardless of site or cover condition, were plotted to show effectiveness in reducing erosion by splash in relation to the amount of cover, the different measurements of amount ranked in the following order of reliability as indicators of relative protective values: (1) Soil coverage, (2) weight of total cover, (3) forage density (estimated), and (4) average height.

The completeness with which the soil surface was covered was the characteristic most closely correlated with effectiveness in absorbing the impact of the rain. Curves expressing this relationship were plotted from the results (Figure 1).

The total weight of cover, including both forage and litter, was an almost equally reliable measure of its protective value (Figure 1). Since weight of cover can be more easily measured than per cent of cover, it is used as the standard expression of amount of cover.

The density of the living stand of plants, estimated as coverage when fully developed and ungrazed (7), and average height of the standing forage, both provided a rough indication of the effectiveness of the cover in reducing erosion by splash. However, there was wide variation from the general trend as determined for either measurement. In either case, the measure reflected in a general way the amount of cover present, but did not take account of the litter on the ground.

The rather wide range in effectiveness of the same amount of cover, as measured by any of the four characteristics just described, suggested that more than one feature might have a bearing on the results. Two combinations of the above measurements gave closer correlations with protective values than either of the single measurements upon which they were based.

This indicated that *effectiveness of cover was best indicated by a dual measurement reflecting both the thoroughness of the covering (coverage or density) and its mass (weight or height).*

A combination of total weight and soil coverage gave the best indication of effectiveness in controlling splash. The product of these two measurements was used as an index of "*effective weight.*" When effectiveness was plotted against this index, the range of variation from the average trend was less than in any other comparison made.

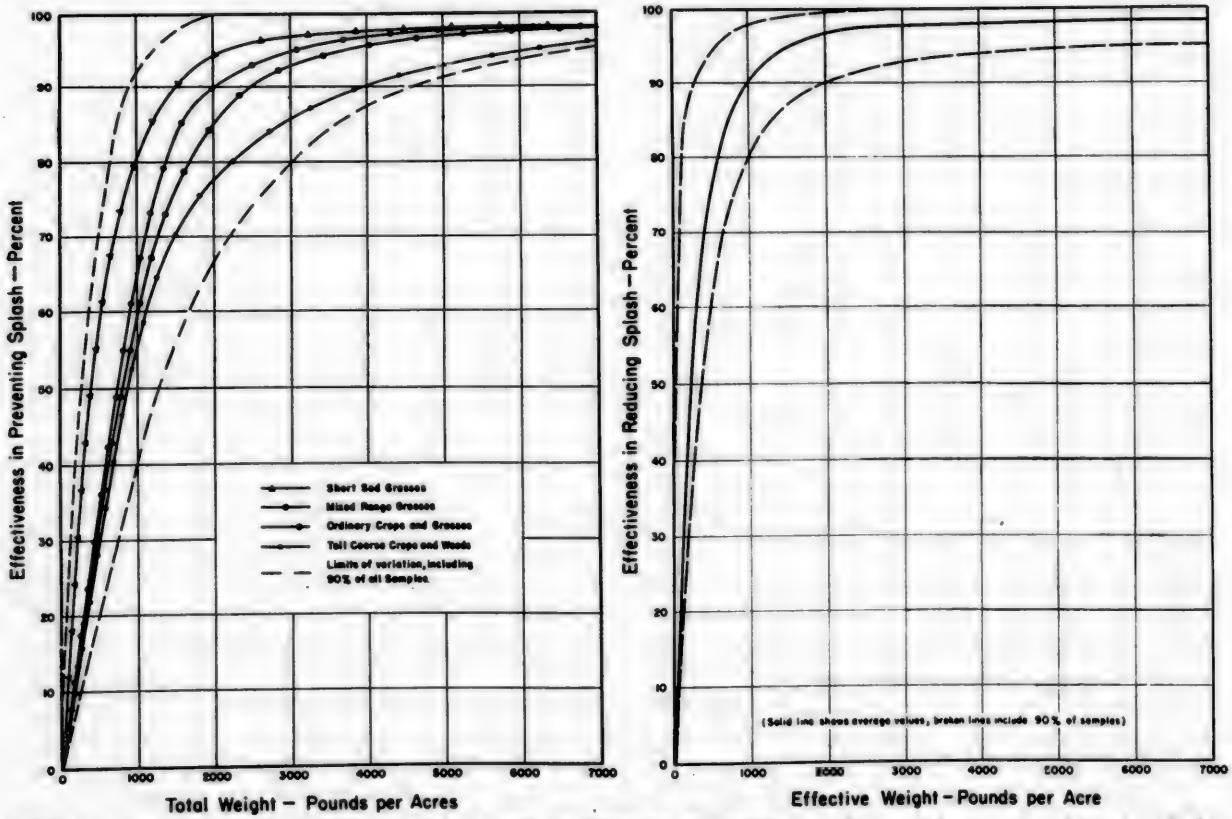

Effectiveness in Preventing Splash — Percent
Total Weight — Pounds per Acres
Short Sod Grasses
Mixed Range Grasses
Ordinary Crops and Grasses
Tall Coarse Crops and Weeds
Limits of variation, including 90% of all Samples
Effectiveness in Reducing Splash — Percent
Effective Weight — Pounds per Acre
(Solid line shows average values, broken lines include 90% of samples)

Figure 2. *Left.* Effectiveness of different kinds of cover in preventing soil erosion by splash in relation to total weight. *Right.* Average effectiveness of all kinds of cover in preventing soil erosion by splash in relation to effective weight (total weight × coverage).

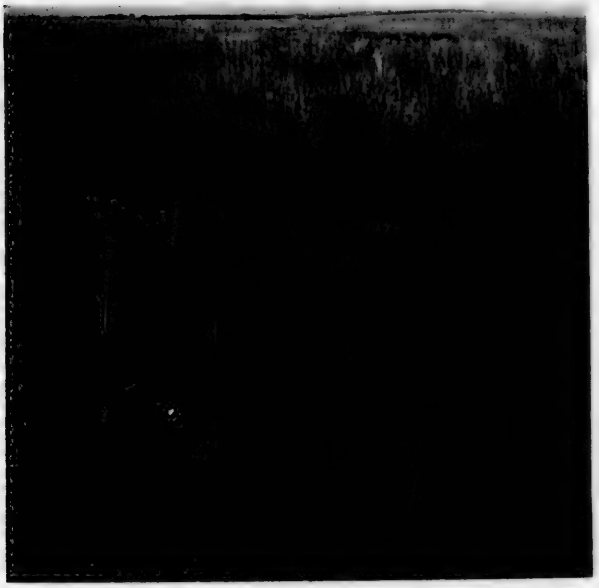


Figure 3. Native bluestem grassland in excellent condition provides maximum volume and density of cover in the Grand Prairie area of Texas. A plot within this meadow having 7,699 pounds of herbage and litter per acre, and providing 100 per cent surface coverage, was fully effective in preventing soil erosion by splash.

By this index, 2,000 pounds per acre of forage and litter covering 50 per cent of the soil surface would have the same value as 4,000 pounds per acre covering 25 per cent of the surface. Both covers would have an "effective weight" of 1,000 pounds per acre and would reduce erosion by splash by approximately 90 per cent.

The spatial volume of the cover, obtained by multiplying the average height by forage density, was a better indication of effectiveness than either height or density alone.

Amounts of Cover Required

These results indicate the usual or average amount of cover required for any degree of control of soil erosion by splash, by whatever means the amount of cover is to be measured or estimated.

The different species of range plants and crops can be grouped, according to growth form, into three categories of soil-protection values, as follows: (1) Ordinary crops and grasses, (2) short sod grasses, and (3) tall coarse crops and weeds.

Curves showing the average effectiveness of each growth form in relation to total weight of cover have been plotted (Figure 2). A fourth curve, representing the average values of mixtures of species of different growth forms characteristic of the natural range vegetation evaluated, is also presented. These curves are similar in form, and all fall well within the principal limits of variation of all plots when considered together without respect to kind of cover.

The different degress of effectiveness of the same amounts of cover of different growth forms, evident in the mid-sections of the curves, undoubtedly reflect the natural positioning of the foliage above the ground that is characteristic of each growth form. These differences rapidly disappear with increasing amounts of cover as effectiveness approaches 100 per cent, except that tall coarse crops and weeds were not completely effective in any amount. This is probably due to a certain amount of splash caused by drops falling from the foliage more than two or three feet above the ground surface after being intercepted.

These differences in the effectiveness of growth forms essentially disappear when the amount of cover is expressed as "effective weight," which takes into account both the degree of surface coverage and the total weight of the cover. A single curve adequately expresses the average protective values of any kind of cover on this basis (Figure 2).

Effective weight is especially useful in judging cover of unusual growth form or irregular distribution on the ground. When the plant materials are of average form, such as the grains, fine-stemmed legumes, or mid-grasses, and uniformly spread over the ground, either weight or coverage alone is a satisfactory indicator of effectiveness in preventing splash. Coarse, woody residues of the sorghums or cotton, on the other hand, may weigh heavily but cover only a very small prcentage of the soil and offer little protection from rains. Likewise, tall open-growing crops like the sorghums, or tall weeds on range land, produce large tonnages in proportion to their cov-

Table 1. Amounts of Cover Required to Control Erosion by Raindrops—
Average amounts for different degrees of effectiveness

Effectiveness	Effective weight of cover[1]	Total weight of cover			
		Short sod grasses	Mixed range grasses	Ordinary crops and grasses	Tall, coarse crops and weeds
Per cent	Lb./ac.	Lb./ac.	Lb./ac.	Lb./ac.	Lb./ac.
98	3,000	4,000	5,000	6,000	——
97	2,500	3,000	3,750	5,000	——
95	1,500[2]	2,000	3,000	3,500	6,000
90	1,000	1,500	2,000	2,500	4,000
85	750	1,200	1,600	2,000	3,000
80	600	1,000	1,400	1,750	2,250
75	500	850	1,200	1,500	1,800
70	400	700	1,100	1,300	1,500
60	300	500	900	1,000	1,100
50	200	400	750	800	900
35	100	250	500	600	600
25	50	175	400	400	400

[1]Total weight (lb./ac.) × coverage (per cent).

[2]2,000 lb./ac. for tall, coarse crops and weeds. Cover of this growth form ordinarily does not exceed 96 per cent effectiveness, attained when effective weight is 3,000 lb./ac.

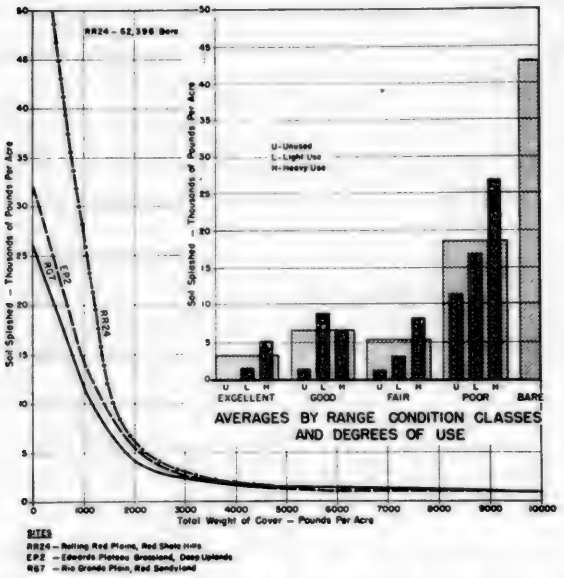

RR24 – 52,396 Dens
U – Unused
L – Light Use
H – Heavy Use
Soil Splashed – Thousands of Pounds Per Acre
EXCELLENT
GOOD
FAIR
POOR
BARE
AVERAGES BY RANGE CONDITION CLASSES AND DEGREES OF USE
Total Weight of Cover – Pounds Per Acre
SITES
RR24 – Rolling Red Plains, Red Shale Hills
EP2 – Edwards Plateau Grassland, Deep Uplands
RS7 – Rio Grande Plain, Red Sandyland

Figure 4. Soil erosion by splash in relation to range cover in the Mixed Prairie.

erage. In such cases, it is important to take into consideration both weight and coverage.

The effectiveness of cover in reducing erosion by splash is a property of the cover itself, and is completely independent of the soil on which the cover occurs. These values, therefore, should be applicable to any examples of herbaceous cover on any site and in any rain. Table 1 summarizes these results in terms of average amounts of cover required to provide different degrees of effectiveness in controlling soil splash.

Soil Splash Under Field Conditions

The amount of soil splashed under field conditions is the combined result of the character and condition of the soil and the amount of cover that happens to be present at the time it rains, as well as the character of the rain itself.

In these evaluations, the amount of soil splashed under actual field conditions was measured. Results showed that cover exercises the controlling influence on erosion by splash. On every soil tested, examples of maximum cover on both ranges and croplands reduced splash to a very small fraction of the potential, regardless of the character of the soil itself. This follows naturally from the function of cover, as previously discussed, i.e., when there is sufficient canopy to intercept all the drops and absorb most or all the energy of the rain before it reaches the soil, even the most easily eroded soil is not disturbed (Figure 3).

Since different soils will erode to different degrees under the same protective cover, because of differences in detachability, it is necessary to consider each site separately.

When this was done, and the amounts of soil splashed were plotted againts total weight of cover, well-defined curves resulted in every case. These showed that soil erosion declined rapidly as amount of cover increased until the full effectiveness of the cover was reached.

The general shape of the curves for all soils on both range and cropland were remarkably similar, although their position with respect to the numerical scale indicating amount of splash varied with the detachability of the different soils.

On Range Land

Figure 4 illustrates typical results from range land. The curves represent the trends in the amount of soil detached on three different sites in mixed prairie range in relation to the total weight of cover on the plots. The bar graph in the inset shows averages for all examples of each range condition class within this range type by means of broad shaded bars, and, within each condition class, the average for each degree of current grazing use, by means of the narrow solid bars.

On all range sites, the amount of soil splash under the standard test started from a high level for bare soil—the amount depending upon its detachability—and declined rapidly in an almost straight-line relationship with amount of cover until a point, usually somewhere between 1,000 and 2,000 pounds of cover per acre, was reached. Here the curves began to break and level off at the full effectiveness of the cover somewhere between 3,000 and 5,000 pounds per acre.

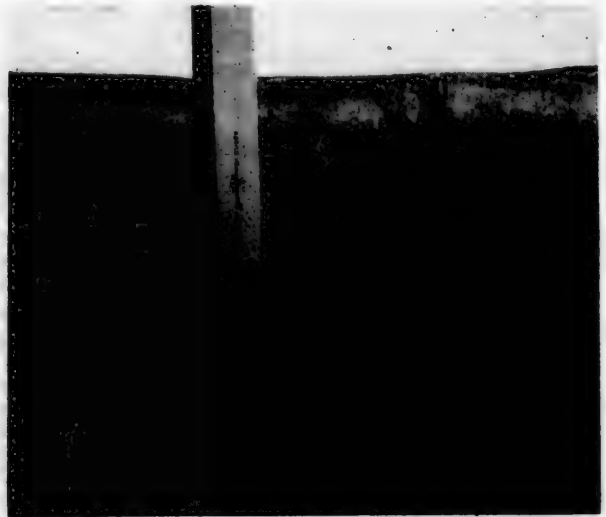


Figure 5. As range condition declines and the continuity of the surface cover is broken, soil erosion becomes increasingly active. A tussock of blue grama four inches high shows the extent to which the exposed soil has been removed.

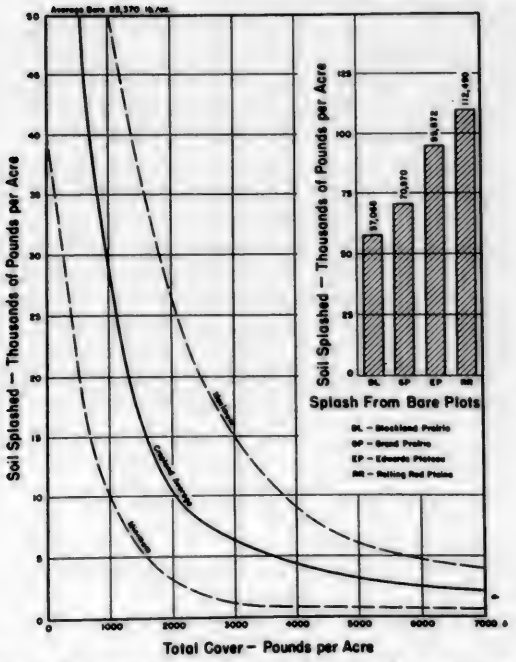

Soil Splashed – Thousands of Pounds per Acre
Total Cover – Pounds per Acre
Ungrazed
Moderate
Heavy
Soil Splashed – Thousands of Pounds per Acre
Splash From Bare Plots

Figure 6. Soil erosion by splash on croplands in relation to amount of cover on four fine-textured soils.

When the results were grouped and averaged by range condition classes and degrees of grazing use, definite relationships were apparent. The amount of soil splashed generally increased as range condition declined (Figure 6) regardless of the rising or falling trend of detachability discussed in a previous paper (5). Splash was invariably greatest from bare ground, even on sites where detachability reached its lowest level under this condition.

Range condition affected erosion primarily through changes in effectiveness of the cover related to the reduced production of lower condition. There were numerous individual exceptions to this general trend, however, as the quantity of cover on particular areas was modified by current or past use, seasonal growth conditions, or other factors independent of species composition.

Within a range condition class, or when all classes for the same site or range type were averaged, soil erosion by splash increased with increasing intensity of use.

Different degrees of use within the same range condition class frequently resulted in greater differences in erosion that existed between the averages of different condition classes. It was not uncommon to find the splash from ungrazed plots of one class about equal to the heavily grazed plots of the next higher class.

On Croplands

Amount of soil splash on croplands in relation to weight of cover on the ground followed the same general trend as on range, although at a somewhat higher level due to the greater average detachability of the soil. Figure 6 shows the average trend for four fine-textured cropland soils. When plotted separately, the individual curves were so close together that a consolidated average adequately expresses all four. The inset shows the average amount of splash from bare soil on each site.

Regardless of the detachability of the soil, the amount of splash on croplands declined in an almost straight-line relationship with increasing amounts of cover until about 2,000 pounds per acre was present, which allowed an average of about 10,000 pounds of splash per acre under the standard test. From this point, increasing amounts of cover gave diminishing rates of reduction in splash until a fairly constant level was reached with about 4,000 pounds of cover per acre, permitting about 4,000 pounds of detachment. This average was reduced to 2,000 pounds per acre where cover amounted to 7,000 pounds per acre.

These results showed that it is not so much the kind of crop grown as the quantity of vegetation, either living or dead, above the surface of the ground that controls erosion. Amounts of cover on a field change rapidly as a crop develops and is harvested, and as the land is prepared for the succeeding crop (Figure 7). Tillage pulverizes the soil and makes it extremely susceptible to erosion until it settles into its natural structure again.

At some time in the annual cycle of most crops, whether classified as soil-improving or soil-depleting, both cover and soil factors favor a maximum rate of erosion. At another season, the possibility of erosion may be negligible, even with so-called soil-depleting crops on the land.

The spacing of a crop on the ground is important. A legume or other soil-improving crop grown in rows, as is common practice in the subhumid regions, may leave as much of the soil exposed as any of the cash row crops (Figure 8).

The method of harvesting the crop and the management of the residues may make a greater difference in its protective value than the kind of crop involved. The yield of ordinary farm products, such as the amount of hay or straw produced, is not a good measure of the cover provided, since the stubble and associated field weeds and grasses may be equally effective. In fact, any material which is in a position to intercept a raindrop before it strikes the ground contributes to soil protection.

For the same reasons, the roots of crops do not serve as soil cover—although they may profoundly affect soil conditions, which are important influences upon both erosion and water intake. Roots cannot shield the land from

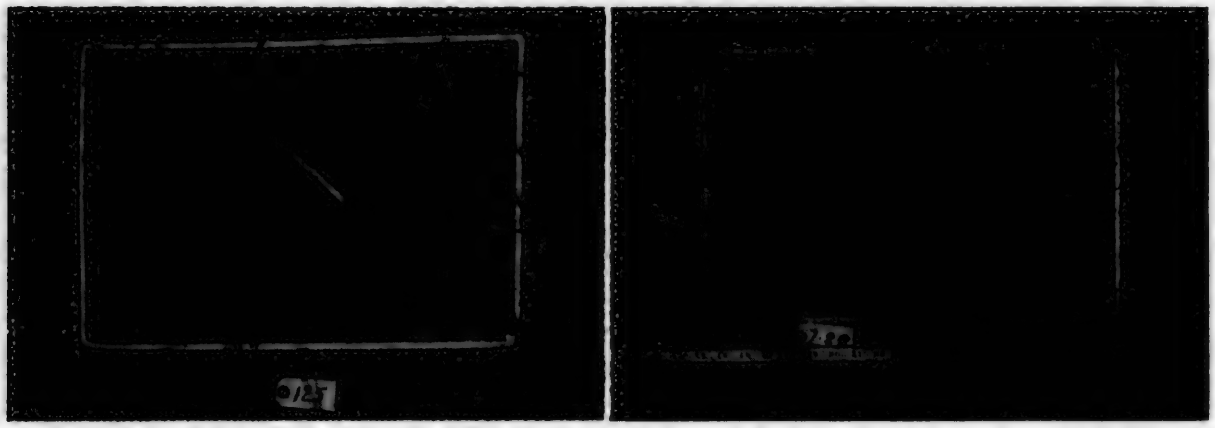


Figure 7. The amount of cover on a field changes radically with the seasonal development and use of a crop. (A) *Left*, a plot of oats stubble in August had 6,451 pounds of cover per acre and was 100 per cent effective in preventing splash. (B) *Right*, in another field of oats, being grazed in May, a plot had only 992 pounds of cover per acre, providing 16 per cent surface coverage and reducing splash 66 per cent.

raindrops until erosion has proceeded far enough to place them on the surface, or until they have been turned up by tillage.

Summary

Measurements of soil erosion by splash under different kinds and amounts of range and cropland cover showed that effective control of erosion is possible on all soils and indicate the amounts of cover required for different degrees of protection.

Effectiveness of cover in preventing erosion is proportional to the amount present to intercept the energy of the raindrops before they strike the soil. Both degree of surface coverage and weight per acre are satisfactory measures of the amount of cover, but the best indication of effectiveness is obtained by combining coverage and weight into an index of "effective weight."

Curves expressing the erosion control values of cover in relation to amount are presented. These show that for effective (95 per cent) control of raindrop energies, approximately 2,000 pounds per acre of short sod grasses, 3,500 pounds of ordinary crops or grasses, or 6,000 pounds of tall coarse crops and weeds are required. Soil-protective values decline rapidly as the amount of cover is reduced below these levels.

Under field conditions, cover exercises the controlling influence on erosion by raindrop impact during hard rains. On every soil tested, maximum amounts of all kinds of both range and crop cover held detachment and movement of soil to a very small fraction of the potential, regardless of the character of the soil itself. The manner in which forage and crops are harvested and their residues managed profoundly influences the soil-protective value of the cover.

Figure 8. Madrid clover, a valuable soil-building crop, may provide only a limited amount of protection from raindrop impact when planted in rows.

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The Federal Partner in Watershed Conservation

RAYMOND A. McCONNELL, Jr.

The first part of an address delivered to the Soil Conservation Society of America at its November, 1953, convention by Raymond A. McConnell, Jr., editor of the Pulitzer Prize-winning Lincoln, Neb., Journal and co-chairman of the trail-blazing Salt-Wahoo Watershed Association of eastern Nebraska appeared in the January issue of the Journal. In that part, Mr. McConnell, an advocate of local-state-federal partnership in community watershed development, discussed the role of local and state "partners" in the Salt-Wahoo experience.

The following final part of his address explains some of the Salt-Wahoo efforts to achieve coordination among federal agencies locally and nationally; recounts its leadership in the nationwide "pilot" watershed program launched last year by Congress; and recommends five "urgent immediate steps" which, Mr. McConnell advises the Journal, appear to him as desirable now as they did last November.

WE BEGAN AND PROCEEDED on the principle that the federal government's role should be that of partner to regional, state and local agencies, in planning and assisting in soil and water conservation and stream improvement. It should share with state and local agencies in the cost of improvements of long-range public benefit, in reasonable proportion to the national, state and local interests involved. This should be on a genuinely cost-sharing basis, with clear provision for federal participation in project-type programs of a watershed scope over and above the normal general conservation program carried on uniformly across the nation.

But for the federal government itself to be an effective partner in line with that princple there must be effective working partnership among the federal agencies themselves where more than one is concerned. Horizontal partnership among government agencies at each level, in other words, is a prerequisite to a working vertical, or federal-state-local, partnership. Integration in federal resources planning, we found, is a word for which there is not yet either adequate legislation or adequate executive formulas. At the local level, public opinion well crystallized can operate pretty well in keeping county, city, drainage, soil conservation and other local subdivisions working in reasonable unison—and where the force of public opinion leaves off we expect the watershed districts to take up. Federally however, we found we had to improvise a makeshift to fill the void. We did not want two rival plans, competing for public favor and public funds, dividing the area, pitting farmer against city neighbor, and upstream against down, and destroying the sense of community we had built up. We wanted one single coordinate plan on which all competent technicians of all knowledgeable agencies could agree. So we laid down a *"coordinating formula"* of our own, assigning primary responsibility for protecting urban values to the Army, and primary responsibility for protecting agricultural values to the United States Department of Agriculture, with the proviso that Army planning should take into complete account such protection of urban values as would accrue incidentally from the upstream agricultural protection. We adopted this as the basic guide of our association, and we got the governor to serve written notice on both agencies and for our files that in the review process he would approve plans of no federal agency for our watershed which did not meet with the approval of our board. Agriculture accepted our interpretation of what this specifically meant with respect to scaling down their plans. An Army area officer who would have liked to accept it fully was transferred to some kind of more comfortable war job. But we feel that we have gone a long ways with the Army and that in the end we will get where we want. Since the President's conservation message of July 31, in which he laid stress on the need of and his desire for integration in planning, I have noted a whole new tone in Army utterances in localities too scattered for the new tone to be accidental. Where not long ago they were saying that the conservation approach was fine, and that we had to have it, but that it wouldn't hold water, they are now talking very sensibly about the need and their desire for integration in planning. Long live the Commander-in-chief. I might add also, God Bless Congress, and Long Live the Governor Whose Letter Is In Our Files, because we feel reasonably secure that Congress will not throw money into projects unless these have the governor's approval, and are sus-

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Raymond A. McConnell, Jr., presented this paper at the Eighth Annual Meeting of the SCSA held in Colorado Springs, Colorado, November 7, 1953. Mr. McConnell is editor of the Lincoln Evening Journal and the Nebraska State Journal, Lincoln, Nebraska. He is a prime mover and co-chairman of the trail-blazing Salt-Wahoo Watershed Association in eastern Nebraska and the spokesman in 1953 for a group of national watershed leaders at a White House conference which gave principal impetus to initiation of the nationwide "pilot plant" watershed program now under way.

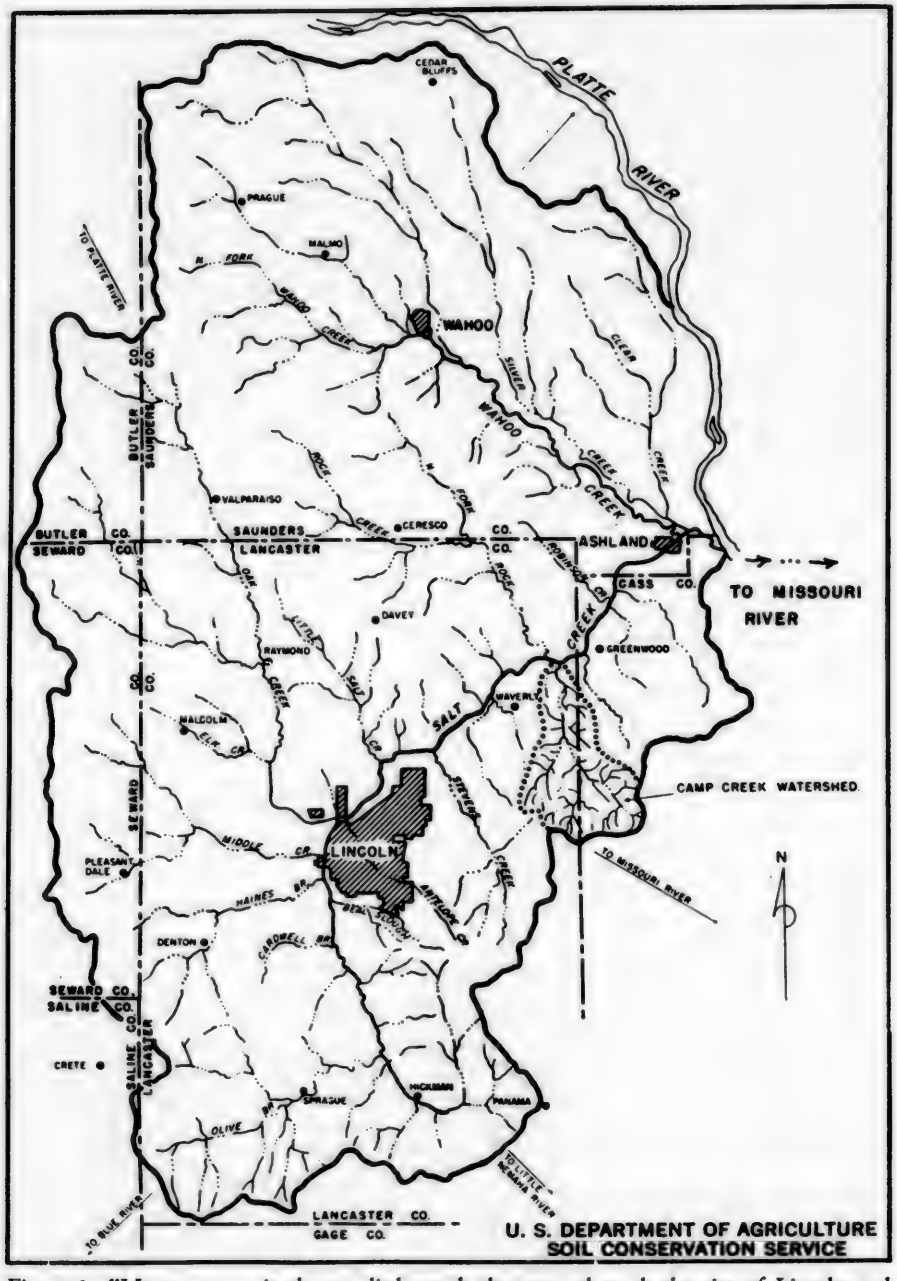

Figure 1. "My story . . . is about a little creek that runs through the city of Lincoln and overflows every so often, with consequences my community is convinced neither it nor the nation can afford . . ."

tained by a clear and harmonious expression from the local people most concerned. As I said I think we will get coordinated federal planning one way or another. But at the moment it is the cumbersome hard way.

The presidential conservation message on July 31 followed by nine days an excursion I made to Washington. The excursion was to urge on Sherman Adams that some such public statement was needed to help tune in the executive agencis with each other, with the previous utterances of the President on conservation, and with the public. It was an excursion to which I had been provoked by a speech of a prominent Army engineer who had come to Lincoln to praise coordination and expound the philosophy that dams built by federal hydrologists in uniform could hold water but dams designed by federal hydrologists with manure on their shoes could not.

But these roundabout formulae and these excursions—and that to Governor Adams was but one of a long series to just about every interested Committee of congress and handfuls of cabinet members and agency heads—are surely not the long-run answer. If they are, our time and our food supply will run out on us before we get the job in hand.

We have set forth the thesis that what an area needs, wants and can afford in the way of resources control and management is something that should be determined not by the federal agencies exclusively, nor in a clash of federal agencies competing for public favor and public funds, but by the federal agencies and Congress working together with each other under the sanction of Congress and in full partnership with the local people.

If this thesis is sound, new legislation, like the Hope-Carlson bill *(Now the Hope-Aiken bill. Ed.)* is needed to spell out the responsibilities of the Department of

Figure 2. Farmers, soil conservation district supervisors, Soil Conservation Service technicians, and others, work together to solve erosion and flood abatement problems.

Agriculture. New and clear executive directives spelling out the specific terms of the President's message could fit the Army smoothly into the federal resources team. Certainly the last word has yet to be spoken about the Department of the Interior.

The 'Pilot Plant' Program

There are two more episodes to my story. We got something started, and we tried but failed to get something stopped.

The something started was the appropriation in 1953 by Congress of an initial $5.1 million in a $29 million dollar program for the speedy development of 50 or more "pilot plant" upstream watershed projects throughout the nation.

This is the Hope-Carlson (and I should add Carl Andersen) program which Clifford Hope, not a boastful or immodest man, rightfully called the "*most dramatic single step forward*" in conservation. Certainly there was drama in it. There was also an element of local experience.

In one of our early educational tours the Salt-Wahoo Association had taken 44 somewhat skeptical farmers in a chartered bus to see for themselves a small watershed where farmers were well along in their part of a coordinated job. One week later 43 of the 44 signed up with the soil conservation district for plans. The 44th later came in. This demonstrated, if we had not already known, the effectiveness of demonstration.

If a program was sound, and people could see a little something of it for themselves, a good deal of talk and a lot of controversy could be spared.

We had pointed out to the late Sen. Ken Wherry that if the federal government could have demonstrational farms to show what is meant by a proper job of conversion from dryland to irrigation farming, as it does, it could just as reasonably establish some small demonstrational areas to show the meaning and measure the effect of the extension of conservation from the basis of individual farms to that of small community watersheds. Especially was this reasonable since the federal government was committed to huge expenditures for downstream development while the effectiveness of working from the top down had had no really adequate demonstration or test. Its merit was on paper, but with the exceptions of a very few areas, not on the land.

We got up a proposal for a small demonstrational subwatershed in the Salt-Wahoo, for which the ingenious and unrelenting Sen. Wherry was on the verge, I think, of getting a modest sum at the time of his death in 1951. That year and the next my group and others hammered on the pilot plant idea—an especially appealing one in Kansas where the controversy raged—before the House Agriculture Committee and President Truman's Missouri Basin Survey Commission. Both reported favorably.

With the change of administrations, I prepared a memorandum suggesting some possible steps by which, through legislative action, administrative procedure and executive action the watershed concept of a conservation partnership could be clearly established as a dynamic part of administration policy. I felt sure that the new

Figure 3. The Salt-Wahoo Watershed Association exhibit has been a popular annual attraction at the Nebraska State Fair.

Figure 4. Air tours of the Salt-Wahoo and neighboring watersheds, for principals and supervisors of the Lincoln City Schools, were made possible through the cooperation of the University of Nebraska Air Age Education Division and the State Department of Aeronautics.

president wanted to make a lasting imprint in this whole area of domestic affairs, and that our concept most clearly fitted in with his whole expressed philosophy. I still firmly believe both of these things.

With this in mind, I circulated the memorandum to some 25 influential people in almost as many states—the foremost nationally-recognized leaders in the watershed movement, a few publishers and editors, and the leadership of the nation's soil conservation district supervisors. I told them I was not interested in their quibbling about this, that or the other phrase. If there was to be a new era of conservation, it was to be an era of action, not talk, controversy, studies and surveys. If they agreed with the broad purport of the memo, I asked them, would they meet in Washington with me in the event that I could arrange a meeting with the President, key cabinet members and interested congressmen. They all said yes, and said so within 24 hours. Action was the watchword.

Rep. Clifford Hope, Carl Curtis, Carl Andersen and Walter Poage, with an assist from Senator Carlson and backed by other influential members of Congress and the administration, all of whom had been equipped with the memorandum, arranged a meeting for us with the President at the White House on February 25.

The President, Secretary Benson, Secretary McKay, Gen. S. D. Sturgis, Budget Director Joseph Dodge, and Dr. Milton Eisenhower, heard our story and, so I felt, heard it understandingly. The President warmed up considerably, it seemed to me, when I told him we would be happy enough to have him cut the budget, just so that in whatever total he allotted to natural resources development, upstream conservation received a more realisic emphasis. It was better balance we were after.

From there we went to a two-hour meeting at the Department of Agriculture to review our ideas more specifically with Assistant Secretary Earl Coke and the agency heads at the so-called operation level. In the afternoon we did a parallel job over on Capitol Hill, with some 60 Senators and representatives in attendance on an afternoon punctuated with committee sessions and quorum bells.

I have often wondered how many movements could have moved as this one did, making a clean sweep in one day in Washington of the whole executive branch of government from the top down and all the way across the board and over to a substantial segment of Congress. I have also wondered how many movements could have raised so many eyebrows as ours did when we got Rep. H. Carl Andersen to call off the first day's hearings on the Department of Agriculture Appropriations Bill so that Assistant Secretary Coke, who had been scheduled to present the appropriations to Andersen's subcommittee and who at no time seemed enthusiastic about meeting with us, could be with us that morning.

We were unable to get money for a small scale demonstrational program of watershed development included in the administration budget. Partly the time element was against us. Partly it appeared to be the Department of Agriculture.

Nevertheless Rep. Clifford Hope and Sen. Frank Carlson, whose names should be engraved on every small retention dam throughout the country where the work is underway or about to get underway today, undertook to get $5.1 million added to the agricultural appropriations bill in Congress. This was to be the first year's installment in a five to ten year program of development for some 50-odd small "pilot plant" watersheds in areas where the people were the most ready and the demonstrational values the most promising.

The course of this item through Congress was like the Perils of Pauline—so much so that it irked me tremendously when the assistant secretary of agriculture, while not giving us the specific assistance we asked for, told me the sum was "just peanuts." Five million dollars will never be peanuts to any taxpayers, and should never be peanuts to any member of an administration so honestly—I think—dedicated to restoring our national sense of values.

We took no chances. Groups of us made expeditions to Washington at every stage of the congressional process. Although the money was stricken by the Senate Appropriations Committee it was finally restored in conference.

Representative Hope called it the *"most dramatic single step forward"* in conservation in this Congress. He wasn't boasting. If you know him as I have come to,

you know that he is constitutionally incapable of boasting or, in my opinion, of the other six deadly sins.

What Now?

Where Do We Go From Here? This is to suggest a few immediate steps of a sort that are urgent if we are not to lose the opportunity, available under the present administration, to make a large start toward achievement of a sound, well-balanced, long range national land and water policy.

Partnership requires mutual understanding and confidence all around. It requires also a clear division of functions and responsibilities among the several partners, and a close coordination, horizontal and vertical. Each must know what the other is doing and intending and must understand why. All must run on parallel tracks.

We have lost some ground and gained some. If we are to continue to gain, there must be . . .

1. A continuing education of the public—of both city and farm people—as to their interdependence in mastering the forces of nature and putting them to proper use. Specifically I would like to see us as a nation get as much value as possible out of the investment Congress is making in the demonstrational watershed program. The returns from that investment could be many times multiplied, for example, if some private foundation were to join in the venture so that there could be, alongside the publicly-financed pilot plant projects, a non-governmental "umpire" of a sort, measuring their effect in every possible way and sponsoring the widest possible dissemination of unbiased information about it. This I think would be a natural for Resources for the Future, Inc.

2. A full and realistic facing up to their responsibilities by the laggard states so that adequate watershed districts can be organized in every river valley in the country where people want them. There also needs to be sufficient mechanism for coordinating these with each other, within states, and between states where streams cross state lines.

A prompt and comprehensive study of this whole field by the Council of State Governments or by the new Hoover Commission, or both, would be a great spur to intelligent state action.

3. Realistic budgeting by the administration and Congress so that the pilot plant program can be speeded along to completion, and so that also a proper balance can be established as between upstream conservation and other river and resources improvement. The $5.1 million this year just barely tips the scales but is only a beginning toward balancing them.

4. Early enactment of the Hope-Carlson bill (*Hope-Aiken*) as a basis for translating the pilot plant program into permanent policy when its effects are known, and so as to spell out the Department of Agriculture's responsibilities in this field. With this there should also be some clear delineation of the responsibilities of the Army and Department of the Interior, and a clarification of conservation responsibility as to the various categories of public lands.

5. The establishment of mechanisms by which the planning and actions of all federal agencies engaged in resources development can be kept in gear with each other and in keeping with the overall objectives of the President.

If we are not to have valley authorities of the TVA type, and I personally do not think we want or need any more, then there needs to be a way by which the authority already vested in the President—adequate in itself—can keep in intimate touch with all the many specific day to day actions of the many federal agencies which add up to the total federal performance in conservation, and in close touch also with local and area thinking and needs.

A representative advisory commission or board of review closely attuned to local and area watershed problems, and neutral as among federal agencies, with a director having the status of presidential assistant and charged with coordinating conservation in the executive branch, is one possible means by which this new administration could establish the essential liaison which has been lacking in the past. There may be other ways.

New Era of Action

Such is my experience and some of the thinking to which it has led me.

In 1908 Theodore Roosevelt saw the beginning of a new era of conservation. He spoke of it as a "*time for the country to take account of its natural resources and to inquire how long they are likely to last.*"

If 1953 is to be the opening of still another "*new era*" in conservation that will be a new era demanding, not inquiry, but action, and action in partnership.

There is a deadline for action, too. That deadline is when the line on the graph indicating rising population crosses the line indicating adequacy of food supply to maintain our present level of diet. It is only the span of my own generation away.

The Betsie and Platte Watersheds Improvement Project

ARVID TESAKER

With the objective of accelerating the conservation of renewable resources—soil, water, forests, fish and wildlife—people representing local groups in parts of three counties—Benzie, Manistee and Grand Traverse—in lower Michigan, formed the Betsie and Platte Watershed Improvement Association about two years ago. A substantial part of the work will be done by land owners, assisted by technical guidance from several agencies. On problems of such immensity that individuals cannot complete them, aid from agencies will be solicited. Work on publicy-owned lands and highways is being done by the agency responsible for such operations.

WATERSHED IMPROVEMENT as a means to an end—the end in this case being the creating of more interest in soil and water conservation and getting more conservation work into effect on the land, was the original stimulus for the Betsie and Platte Watershed Improvement Project in Benzie, Manistee and Grand Traverse Soil Conservation Districts in northwest lower Michigan. Directors of the Benzie District discussed such a project at several of their meetings early in 1952 and they consulted with Soil Conservation Service personnel assisting their district. They also studied reports about the Rifle River Watershed Improvement Project in Michigan which had gained nationwide attention.

After discussing the proposed project with local people, a letter was written to the Benzie Sportsmen's Club, which has large membership in a county of rather small population, asking them to consider a watershed improvement project on two bodies of water that mean so much to local people, to fishermen, resorters, and out-of-doors loving people. This letter was read to a large group of sportsmen where land use was the main subject.

Paul Barrett, land use specialist of the Extension Service, gave the idea a good recommendation; fish, game, and forestry men added praise to the desirability of such a project. Newspaper publicity helped greatly to stimulate discussion of the watershed improvement project and voiced an indication for its need. The result was unanimous adoption of the idea by local sportsmen's club members.

After several additional meetings to acquaint the public with the nature of watershed improvement work and its possibilities, representatives from numerous local organizations, such as chambers of commerce, service clubs, industry, road commission, farm organizations, county supervisors and village and city councils were invited by the Benzie Soil Conservation District directors to discuss features of the watershed improvement project. A letter was proposed, to be sent to Director G. E. Eddy of the Michigan Department of Conservation, inviting participation and assistance of technical personnel.

Arvid Tesaker, a member of the SCSA, is work unit leader, Soil Conservation Service, with headquarters in Benzonia, Michigan.

These meetings and contacts resulted in a tour and discussion meeting late in September, 1952. Local organizations were well represented at this meeting held with officials from the Department of Conservation Fish, Game, Forestry, and Education Division, Soil Conservation Service, Michigan State College Extension Service, and the Farm Home Administration. Each person had an opportunity to ask questions, make comments, and offer opinions of what a watershed development project in this area would mean.

It was pointed out that work done by individual land owners to control soil erosion—even at some distance from the stream—would improve water conditions of clearness and steady flow. There were reports on watershed improvement in other parts of Michigan. It was concluded that local people had recognized they had a problem as evidenced by interest shown in the project.

Later in 1952, local people organized the Betsie and Platte Watersheds Improvement Project and elected Don B. Jewell, retired county agricultural agent from Benzie County, as chairman. His knowledge of local land conditions and acquaintance with people and agencies working in the area has proved to be of immense value in coordinating activities of the project.

There has been no formal written statement of what any of the several agencies in the watershed development work will do. A number of agency people, however, working in the area, are considered by the local watershed organization to be essential for the type and quantity of work involved; additional help will be requested when required. Examples of how some of this work is being accomplished is the soil conservation planning and practice lay-out carried on by the Soil Conservation Service in assisting districts; Department of Conservation personnel working on both state and privately owned land, and the county agricultural agents working with farmers and farming problems.

In order to better integrate work of the agencies, a meeting was held early in January, 1953. An overall agency chairman was appointed to take information back to the local organization and an agency technical chairman was appointed to correlate the activities of the

agencies. At this time agencies developed a definite plan of action; what each agency would be responsible for, and set tentative deadlines for completion of some phases of the work. Briefly, these responsibilities are as follows:

Land conditions and road ditch survey—Soil Conservation Service; social and economic factors—Michigan State College Extension Service; wildlife management needs—Game Division of Michigan Department of Conservation; streams and lakes—Fish Division; forest resources and management—Forestry Division; forest pest control—Bureau of Entomology and Plant Quarantine; forest and grassland fire prevention and control—Field Administration Department of Conservation; parks and recreational facilities—Parks Division; educational program—Extension Service; water pollution—Michigan Water Resources Commission; land ownership—local committee; industry, utilities, urban development—private enterprises.

In October, 1953, the local organization adopted a set of by-laws, patterned after those used by the Brandywine Valley Association. Membership dues were set and a board of directors elected. Membership is open to people representing local groups, such as chambers of commerce, service clubs, industry, village councils, and sportsmen's clubs; to people not affiliated with these local groups; and associate members. The associate memberships are primarily for non-resident land owners in the watershed and other interested people.

Surveys and Other Work

A number of surveys have been completed on the Betsie River watershed; others will be made as soon as the local improvement organization considers them necessary and as personnel is available.

A land condition survey was made by the Soil Conservation Service, primarily as part of its job of assisting the three soil conservation districts in the area. This survey and study was made of 53 sample areas of 160 acres each, selected by random sampling. It included field work to determine soil types, slope and degree of erosion, along with present land use. The material from this survey is being compiled into a detailed report, part of which appears later under the heading of "*The Betsie River Watershed.*" A survey of road conditions relating primarily to ditches is being included with the Soil Conservation Service report on land conditions.

Personnel of the Michigan Department of Conservation's Fish Division, working on watershed management, have completed preliminary surveys on parts of Betsie River and parts of its watershed. The section of the stream between a point 9 miles east of its outlet to 24 miles east of its outlet (primarily between two power utility reservoirs) has been examined. This survey relates to conditions which affect the streams themselves and how fishing and other wildlife activity may benefit by an improvement program.

There will be need for 800 bank and stream structures on this section of the stream. Most of them apparently will have to be made of timber since there is little native stone in the area. On the Little Betsie River, the largest tributary, the study indicated need for a limited amount of bank stabilization, some fencing to exclude livestock from the bank and stream, 175 structures on the 10 miles of stream, including deflectors, stump and log covers, sodded rafts, and pool-creating dams. A seepage and temperature study will be needed before extensive work of fish habitat development and shade plantings are made on portions of this tributary.

The Water Resources Commission of Michigan has found the Betsie River unusually clear and free from pollution that would be detrimental to fish or other aquatic life.

The Forestry Division states that of the state-owned land of 35,700 acres, 22,600 acres are considered fully stocked with trees; 8,150 acres are in need of some tree planting, and 4,950 acres are open land. The open land will be planted over a period of 25 years to fit in with the game management plan. A timber survey is in process of being completed, which will provide information for a plan of forest management. Recommendations for privately-owned woodlands will be developed from information available from the Lake States Forest Experiment Station, Michigan Division of Forestry, Soil Conservation Service, and the Cooperative Extension Service.

Pest control information to date is confined to white pine blister rust. All white pine areas of one acre or more have been examined. It was found infection ranged from none to medium intensity. Eradication of the alternate hosts of the disease—currants and gooseberries—is being carried cooperatively by the State of Michigan and individual land owners.

Educational work on the watershed improvement project has been carried on through meetings, newspaper and magazine articles, and voluntary participation in some of the actual field work. The Extension Service of Michigan State College, through its local county agricultural agent, is coordinating these activities.

Recommendations for game and fish management are being developed by the Game Division and Fish Division of the Michigan Department of Conservation, through district offices. Assistance on some phases of this work is being handled by sportsmen's groups, Future Farmers of America and 4-H clubs.

Social and economic studies made by the local county

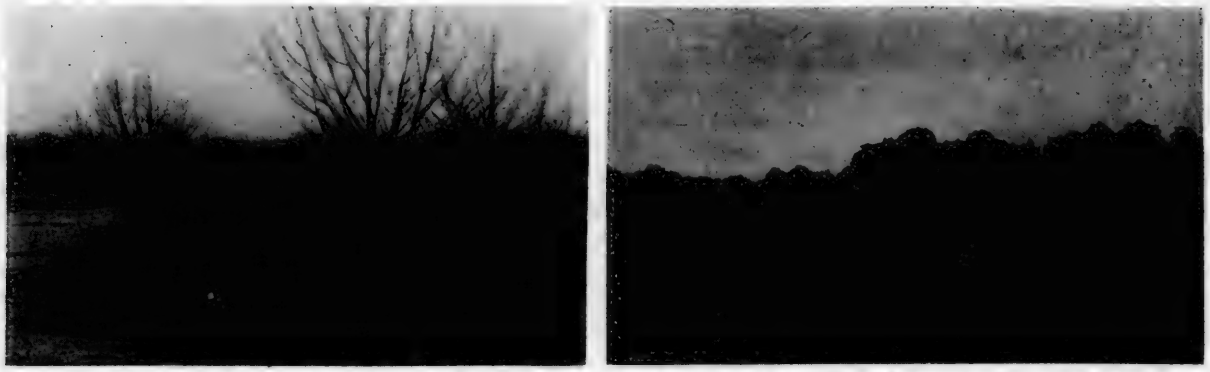

Figure 1. *Left.* Wind and water sheet erosion are major problems in watershed areas. Here the erosion damage is beginning to show up a young sweet cherry orchard—the small area of ground around each tree is already higher than the open cultivated "middles," indicating soil is being moved away. *Right.* The cultural practice of trashy cultivation in orchards is an effective method of controlling erosion in orchards on level to gently rolling land. Here in a young cherry orchard, a winter cover crop has reached good growth in the spring and has knocked down and partially worked into the surface of the soil.

agricultural agent indicate that 6,902 people live within the watershed area and will be directly affected by its improvement. There are 382 operating farms with an average ownership of 125 acres. The average crop harvested acreage is just below 30 acres per farm. The importance of forestry as related to part of the farming operations is shown by the fact that there is an average of 38 acres of woodland for each farm. Idle or grazed land constitutes a large portion of each farm, which should be put to more suitable uses or permanent cover.

The Betsie River Watershed

In planning operations of the Betsie and Platte Watersheds Improvement Project, it was decided to concentrate on the Betsie River watershed first. The Michigan Department of Conservation had done some stream improvement work on the Platte River in previous years and desired to investigate the possibilities on the Betsie. There is need for stream studies on the Betsie and its tributaries because of its popularity for fishing. Because of this, information included here is specifically in regard to the Betsie River watershed. Material includes a number of problems and corrective measures which would be applicable to a number of areas similar to this part of Michigan.

The Betsie River watershed is located in the Benzie, Manistee and Grand Traverse soil conservation districts. Its source is about 33 miles from Lake Michigan; the flow is generally in a westerly direction, and it empties into Lake Michigan at Frankfort. The topography of this watershed is typical of much of northwest lower Michigan—consisting of sandy plains, low sandy and gravelly hills, interspersed with islands of heavier textured soils.

Of the total 165,800 acres in the watershed, 115,442 acres, or 69.6 per cent, is privately owned; 35,700 acres, or 22.6 per cent, is owned by the state, mostly within the boundaries of the Fife Lake State Forest, and the remaining 14,658 acres, or 8.8 per cent, is water (lakes, streams, flowage). Of the 115,442 acres in private ownership, about 10.5 per cent is in cropland; 0.6 per cent in orchard; 3.5 per cent in pasture; 53.6 per cent in woodland; 27.2 per cent is idle, and 4.6 per cent in other uses (urban, resort, industrial).

Precipitation is an average of 28 inches per year, 11 inches of which is in the form of snow. Water use on farms is principally for livestock, domestic use and spraying, with irrigation coming into the picture. Water is supplied through wells and occasional springs and ponds.

Wind erosion is a major problem on all unprotected land except low-lying wet soils. The major damage from wind erosion is to growing crops; there is also unevaluated damage to soil. Water erosion, mostly in the form of sheet erosion, is a problem on much land being farmed, but not to the extent of wind erosion. Wind erosion affects about 9,450 acres at an estimated annual damage of $13,700, while water erosion, affecting 10,250 acres, does an annual estimated damage of $4,800. Some areas are affected by both wind and water erosion.

Relatively few gullies contribute sediment to the Betsie River and its tributaries. Secondary highways, surfaced with sand or gravel, where crossing streams, are a source of sediment and silt. Stream bank erosion is a serious problem where the streams are hemmed in by raw, exposed banks. Gullies, roads and stream bank erosion are causing little or no damage to agricultural land so have not been evaluated in this study.

The water level in the Betsie has been found to fluctuate not more than four feet, a characteristic that makes

Benzie Record

Figure 2. Recreation, such as fishing trout, is an important use of water resources in the Betsie River Watershed Improvement Project. This demands clear water, suitable spawning and feeding areas. Pictured are people lined up on the Betsie River, just below the Homestead Dam, on the opening day of trout season.

this a minor source of silt and sediment. At one location, nine miles from its outlet at a utility company water impoundment, the water level is raised during the night and lowered during the day, exposing a considerable area of raw banks. This adds to the problem of having clear water on that section of the river.

The proposed program of improvement includes the use of land approximating its capability. Land capability, as used here, is a classification of land according to the degree of limitations in its use. To be included are soil treatments, installation of measures to protect the soil from wind and water erosion, and a program of crops and practices to increase farm income.

Costs of installing the improvement program on private land, based on 1952 prices for such measures as changes in land use, erosion control structures and practices, increased production through added amounts of fertilizer and lime, sand blow stabilization, tree planting, and control measures on secondary highways amount to an estimated $1,391,700.

As an illustration of installation expense, 17,068 acres are proposed for reforesting. At current rates, this costs $25 per acre or a total of $426,700. Much of this work is being done continually by farmers and other land owners as well as county road commission forces, so it should not be considered as an added expense item. On the other side are the benefits to be derived from this improvement program, such as from the items of erosion control and crop production stated at $195,000 each year. Added to these benefits are improving conditions for fish and wildlife which will in turn result in added attraction of the area for recreation and resorts.

Road bank and ditch stabilization work will be and is being done by county road commissions. For example, an outstanding job of ditch sodding is being done by Benzie County forces. They consider that a little more expense at construction time will be more than repaid by less maintenance cost.

This study indicates that a large share of the watershed improvement work on private land will be done by the farmers using soil conservation practices. At present there are soil conservation plans in some stage of establishment on 136 of the 382 farms in the area.

A number of people working with the local organization of the Betsie and Platte Watersheds Improvement Project have stated their ideas on the particular phase of the project with which they are concerned. Portions of this material are presented here, listed by subjects.

Watersheds—"A history of Michigan will give us some idea of the changes wrought in our streams during the past century. Our efforts (watershed management) are the ways and means of restoring the necessary stabilizing factors that affect stream flow to produce clean, cool waters. Chiefly due to the efforts of man and the dynamics of nature, watershed values are being restored."

Agriculture—"The modern understanding that any successful and permanent agriculture must be based on proper land use is becoming well understood by most farmers. The most important agricultural needs in the watersheds are erosion control and fertility build-up. These can be achieved by methods and practices that will improve both the farmer's own financial returns and help advance the overall plan of better watersheds."

Soil Conservation—"The wise land owner is using his land within its capabilities and treating it according to its needs. Using practices that fit the land will give the landowner and the community the greatest return from the land. A successful watershed improvement program uses all of the facilities of the people and will be consistent with the local people working together to accomplish a common goal."

Forestry—"Good forestry practices are closely allied with watershed management. Since a large portion of these watersheds are in forest with more to be added through tree planting, good forest management will add considerably to the economy of the area. Protection from fire and grazing, pest control, and good harvesting practices with efficient utilization are included in good forest management."

Wildlife—"Wildlife, or more specifically game, is a product of the land so its management must be considered in the multiple use of land in watersheds. Important tools of management are habitat manipulation, which includes planting trees and shrubs, cutting timber, leaving openings, and at times, burning over certain areas to create openings."

Factors that Determine Spring Runoff in the Northern Rocky Mountains

C. ALLAN FRIEDRICH

The most usual time for flooding to occur in the Northern Rocky Mountain area is during the spring snow-melt season, April through June. The heavy snow pack in the mountains provides the water for spring floods and also for filling irrigation reservoirs. For a decade or more a network of snow measurements have provided information of value in estimating probable adequacy of water for irrigation. There has been some tendency to rely too heavily on these same measurements for forecasting probability of flooding.

FORESTERS AND OTHER LAND managers in the Upper Columbia and Upper Missouri River Basins are conscious of the fact that their activities have an important bearing on spring runoff. They know that two-thirds to three-fourths of the water in the upper reaches of these streams come from forest land, much of it from accumulated winter snows. They know that road building, timber cutting, stock grazing, and prescribed burning likely have an important effect on the quantity and quality of water produced. Residents of the towns and cities downstream and owners of farms and industrial property are conscious, too, of the headwater areas because many of them have lost homes and livelihood from past spring floods.

Although most of us recognize the importance of flood prevention work and the necessity for accurate local forecasts of spring runoff, there is little specific data available on which to establish the definite relation of spring floods to the many variables that control them. There seems to be a number of situations that can produce floods. While the Northern Rocky Mountain Forest and Range Experiment Station has not made a detailed appraisal of various spring flood conditions, records have been collected in recent years that are of interest.

Three years of contrasting situations are represented by 1948, 1950 and 1953. Severe spring floods occurred throughout the Columbia Basin in 1948 following the melting of heavy winter snows. In the spring of 1950, with an even greater snow pack, little flooding occurred. Severe local floods especially in the Upper Missouri, were experienced in June, 1953 due largely to causes other than snow melt. The following case histories attempt to explain the differences among the years and point to a better understanding of spring runoff.

C. Allan Friedrich, a member of the SCSA, is associated with the United States Forest Service and works on watershed management in the Division of Recreation and Lands. His headquarters are in Missoula, Montana.

Columbia Basin — 1948

In 1948 floods in the Upper Columbia and much of the lower Basin may be considered as an outstanding example of the snow-melt type of flood. Some of the factors contributing to this flood were:

1. Above-average 1947 fall rains went far in recharging the retention storage space in the soils.

2. An above-normal snow pack extended to low elevations. On April 1 the pack averaged about 110 per cent of normal in the Kootenai, 120 per cent in the Flathead, and 135 per cent in the Upper Clark Fork areas of western Montana, and 130 per cent in the Clearwater drainage of north Idaho.

3. Unusually cold weather in March, April, and early May prevented early melt and kept the snow pack intact even to low elevations so that a large portion of the watershed was still covered with snow as late as the middle of May.

4. About the middle of May a large warm air mass moved into the Basin and stayed for two to three weeks causing simultaneous and sustained melting of the extensive snow cover, even at high elevations, on all aspects and under all cover conditions. Thus, instead of the normal natural scheduling of runoff, first from low elevations, south slopes and open areas followed by progressive melting and runoff at higher elevations, on north slopes and timbered areas, all these areas were contributing runoff simultaneously.

5. The normal, natural diurnal scheduling of runoff was also upset. Normally, the daily peak from a minor tributary entering near the mouth of a large stream is out of the way before the daily peak-flows from minor tributaries near the head of the stream have come down. In 1948, with the day and night melt, flow from the tributaries piled up in the larger streams.

6. Rain was important in some areas, but since the few recorded thunderstorms did not occur over large areas simultaneously they probably had little effect on the overall flood conditions although they did contribute to local flooding. Most of the Upper Columbia received

Figure 1.—Measuring the snow pack in the Northern Rocky Mountains is very important as an aid in estimating the amount of snowwater available for spring and summer streamflow. Weather during the snow-melt period largely determines the nature of the spring runoff. Here a Forest Service technician is using a 12-foot tube to measure snow at the Priest River Experimental Forest in north Idaho. *(Courtesy of Ross Hall Studio, Sandpoint, Idaho)*

about the normal amount of rain during the snow-melt period.

7. The extensive nature of, first, the cold spring conditions which retarded melt basinwise, and second, the large warm air mass which brought sustained melt basinwise were unusual. Thus, not only diurnal but natural geographic scheduling of peakflows was upset. Nearly all headwater areas were in flood stage at the same time so that when peakflows from all major tributaries converged on the lower Columbia simultaneously the flood was even more disastrous there than in the upper reaches.

The 1950 Situation

In the spring of 1950 it appeared that the stage was set in the Upper Columbia for a worse flood than in 1948, as indicated below.

1. Although the fall of 1949 was not quite as wet as that of 1947, fall moisture averaged about normal or a little above so the soil storage space was well filled beneath the snow pack.

2. The snow pack was even greater than in 1948. On April 1 the pack was 145 per cent of normal on the Kootenai, 140 per cent on the Flathead, 130 per cent in the Upper Clark Fork, and 160 per cent in the Clearwater.

3. March and April were cold and melt had hardly begun by the first of May, even at rather low elevations. As in 1948, a large part of the watershed area was still snow covered when the melt began.

Because of these conditions Forest Service research teams were stationed high in the Kootenai, Flathead, and Clearwater watersheds to study and collect data on snowmelt, climatic conditions, and streamflow during the snowmelt season. Progress of the melt was documented by weekly measurements of numerous snow courses located at various elevations, on all aspects, and under various types of forest cover as well as in the open. Daily temperature and precipitation measurements were maintained in strategic locations at each study area. These data were correlated with records from the nearest stream gage.

Following is a brief summary of some of the findings which seem to suggest why serious flooding did not occur in 1950:

1. The 1950 melt period, which began about the second week in May, was broken every three or four days by a cool period. During a few days of warm weather the runoff would build up until streams were about bankfull. Then during subsequent cooler weather the streams would drain out and the process would start over again. In the Kootenai study area this phenomenon was repeated five times between May 10 and June 15. By this time the snow was so nearly gone that streamflow no longer responded to high temperatures. In the Flathead and Clearwater areas streamflow followed temperatures up and down six times between May 10 and June 25.

2. Comparison of 1948 and 1950 hydrographs for Bear Creek, tributary to the Middle Fork of the Flathead, shows that there was more runoff during May and June in 1950 than in 1948 with the instant highest peak nearly equal. In 1948 flow of Bear Creek stayed above 250 cubic feet per second for 19 consecutive days, May 18 to June 6. In 1950 it stayed above 250 cubic feet per second for only 11 consecutive days, June 11 to 22. But in 1948 it stayed above 150 cubic feet per second for only 26 consecutive days compared to 55 days in 1950.

3. In 1950 the extreme peak on Bear Creek occurred after four inches of precipitation which came as about nine inches of snow followed by two warm days with rain. In 1948 the Bear Creek peak followed a week of warm weather with but little precipitation. The 1950 precipitation was not general and therefore the Bear Creek peak did not coincide with peaks on many other small streams and flooding was only local.

4. Melting in 1950 was caused by what might be described as normal spring weather, a few weeks late. Natural scheduling of streamflow operated effectively.

Figure 2.—During a sunny spring, snow may last one to three weeks longer under the forest shade and on north slopes than in the open, but when warm moist air masses are held close to earth by cloudy skies, cover and aspect have less effect. In some situations snow has been known to last longer in the open than under forest cover. This view is in the famous Big Hole Basin of Montana. *(U. S. Forest Service photograph)*

Therefore, although streams were high, the runoff took place with little flood damage anywhere.

5. Since melting was caused largely by sunshine, instead of a warm air mass as in 1948, the snow went first at low elevations, on south slopes, and in the open. Snow course measurements show that open courses were bare an average of 10 days earlier than courses in the timber. (Figure 2.)

The Spring of 1953

In 1953 serious flooding occurred in some parts of the Northern Rocky Mountain area. Though this was during the snowmelt period, it was not a typical snowmelt flood like that in 1948. The following facts are relevant to behavior of the runoff:

1. Fall 1952 precipitation was far below normal.

2. Snows, when they came, fell on dry ground even at high elevations.

3. January 1953 was unusually mild and wet bringing rain at low elevations and snow at high. February was also milder and wetter than normal.

4. The snow pack continued to build up at high elevations until April but little snow ever accumulated below 4000 to 4500 feet. On April 1 the pack in Sun River, a tributary of the Missouri near Great Falls, Montana contained less water than in any of the four previous years as of that date. Six snow courses averaged 10.0 inches compared with a 13.9-inch average.

5. By May 16 roads were open at higher elevations than usual. Considerable snow at moderate elevations had melted in orderly fashion so that some forest roads were passable to about 5000 feet. Yet roads at the higher elevations remained blocked later than usual. Streams were generally low and clear on May 17.

6. By the middle of May there was little danger of major floods in the Upper Columbia and Missouri areas from snowmelt because only a relatively small portion of the watershed was still covered by snow. The remaining snow consisted of a deep pack at high elevations. This situation seemed ideal for sustaining streamflow well into the summer.

7. About May 24, a large moisture-laden air mass moved into central Montana from the southeast. Cold air moved in under it from the west and a low pressure area developed in the vicinity of Great Falls. This condition continued intermittently until about June 10. As a result, an unusually large amount of precipitation occurred throughout an area which might be roughly bounded by a line connecting Butte, Drummond, Cut Bank, Lewistown, and White Sulphur Springs. During portions of the storm period stations such as Superior, Missoula, Kalispell, and Bozeman, lying outside the area described, received 24-hour amounts exceeding an inch on one or two days.

8. At Great Falls a total of 9.90 inches of rain was recorded at the official Weather Bureau station during the period of May 24 to June 3. The north and west facing slopes of the Little Belt Mountains and the Highwood Mountains received considerably more total precipitation than Great Falls. The storm center appears to have been in the Highwood Mountain vicinity where a total of 18.79 inches was measured at Shonkin, on the north slope. The Conway Ranch on Tenderfoot Creek on the west slope of the Little Belts reported 14

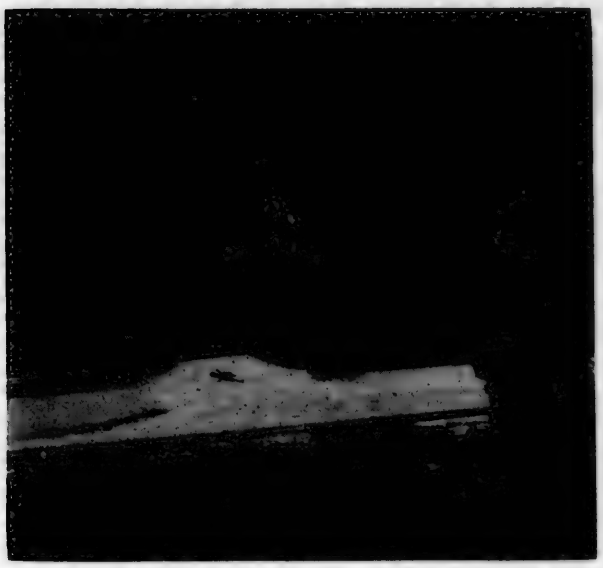

Figure 3.—In June, 1953 a combination of moderate snow melt plus unusually heavy rains resulted in very heavy runoff. Stream channels restricted by road grades and inadequate bridges, and choked by sediment and floating debris from mining and logging activities, were unable to carry the load. Considerable damage resulted along Belt Creek and other streams in the vicinity of Great Falls, Montana. *(U. S. Forest Service photograph)*

inches of rain in the first 10 days of June. The greatest intensity measured by the U. S. Weather Bureau was 0.07 inch for five minutes at Great Falls. Undoubtedly much more intense showers occurred locally. At Shonkin more than 6.5 inches of rain fell during each of two different 24-hour periods.

9. Abnormally cool weather accompanied the rainy period May 24 to June 3. Some general snowmelt occurred but melt was certainly not unusually rapid during this period.

10. Growth of vegetation was delayed by cool weather in April and early May. Thus, range plants and crops had not drawn a normal amount of water from the soil during the first few weeks of spring. Rains fell on soil with relatively little storage capacity.

11. Therefore, after a few days of rain the streams began to rise, as a result of both seepage flow and surface runoff from moderate and low elevations combining with normal snowmelt runoff which in some areas was supplemented by heavy rainfall at high elevations. (Figure 3.)

12. Flooding in downstream areas, as in 1948, occurred because of sustained high flows from all small tributaries augmented by unusually high flows from a few tributaries which apparently received higher intensity storms than the rest. Normal scheduling of runoff was ineffective.

Conclusion

A variety of factors working together can contribute to spring runoff and flood conditions in the Northern Rocky Mountain region. Sometimes weather and condition of the snowpack team up to produce a disastrous flood as in 1948 on the Columbia. Favorable weather with even more critical snow packs may produce orderly runoff with a minimum of high water. Little can be done to control the weather, especially flood-producing rains such as occurred in 1953, but a better understanding of how these factors operate will enable land managers to appreciate the problems ahead in achieving the greatest practical degree of flood prevention. Programs of water resource management will then be on a sounder basis.

Local People Have Final Responsibility

Soil and water problems are urgent and their solution is difficult. The scientist and the legislator, the technician and the businessman, the educator and the sportsman—each has an important part of the job. All the people have a vital stake in the success of the national resource-conservation program.

The final responsibility, however, for carrying out a sound, vigorous program of conservation rests with the people who own and operate the land. Soil conservation districts, and other groups, locally organized and locally directed, provide effective mechanisms by which the conservation program can be locally managed and kept close to particular local needs. Teamwork is the key to a successful, productive program that will build and maintain strength in the land.

—FROM STRENGTHENING AMERICAN AGRICULTURE THROUGH RESOURCE CONSERVATION
U.S. Department of Agriculture

Results Obtained from Plowing Under Sand Deposits In the Kansas River Valley

C. E. CREWS

Experiences in the Kansas River valley following the 1951 flood have shown that long periods of low productivity is not necessarily the fate of land that has been covered by sand deposits during floods.

Actually, much of the land in the valley that had been covered by sand in 1951 produced good yields in 1952 following deep plowing and the use of commercial fertilizers.

Where a good job of deep plowing had been done, corn yields ranged from 66½ to 69 bushels an acre on land that had been covered with sand ranging from 4 to 36 inches deep.

Corn yields on similar land that had not been deep plowed ranged from 43-1/3 bushels an acre where the sand cover was relatively light to about 12½ bushels where the sand was 24 to 36 inches deep.

This yield information was gathered by the Soil Conservation Service, which had the responsibility for supplying the technical services in connection with the farmland rehabilitation program authorized by Congressional Act.

Under the Act, funds were provided to help farmers restore flood-stricken land, with payments handled by the Production Marketing Administration. The Soil Conservation Service made the necessary surveys to determine the feasibility of proposed jobs, prepared cost estimates, supervised the work, and finally determined the adequacy of the treatment.

Altogether, 100,000 acres of the Kansas River bottomland was covered by detrimental deposits of sand or silt, or deeply scoured by the river currents, including about 10,000 acres that had been swept away by the river. Another 200,000 acres had been less seriously damaged through clogging of drainage channels and ditches, and silting of meadows and pastures. Only treatment of the sanded land is covered here.

Sand deposits aroused much pessimism among the farmers. The only precedent was the experience of old-timers following the 1903 flood. They reported that it took a generation of unprofitable operations to bring sand-covered land back to good production. Hence, the present interest in results from deep plowing, which was new to the Kansas River valley and was made possible by equipment of types that had not been available in the early days.

Specifications for deep plowing were arrived at in conferences of Kansas State College and Experiment Station officials, Soil Conservation Service, Production Marketing Administration and other agency representatives, farmers and contractors. It was agreed that deposits of medium and coarse sands less than 30 inches deep could be plowed effectively—that is, about eight inches of soil could be brought to the surface from beneath that much sand—and qualified for flood rehabilitation aid.

Farmers deep-plowed about 9,500 acres for which they received federal aid. The average cost was $41 an acre. Considerably more land was deep plowed by the farmers without such financial help. Some of this land has minor sand deposits and some is covered more deeply than 30 inches.

Yield Data

Information about 1952 corn yields on sanded land was gathered from 112 representative plots, of which 87 had been deep plowed, along the Kansas River in Shawnee County and eastward. The percentages of deep-plowed and check plots that had been fertilized were the same. Sand deposits ranged from four to 14 inches on 49 plots, from 14 to 25 inches on 53 plots, and from 25 to 36 inches on 11 plots. The deeper sand was leveled to 30 inches or less before plowing.

The unplowed plots were mostly king-sized turn rows resulting from maneuvering two or three tractors and a big, clumsy plow at the turns. Some were plots to which the crop was extended beyond the deep-plowed area, some were very deep sand. There was no yield of corn to harvest from some of the deep sand deposits. These plots were dropped from the calculations.

The deep-plowed plots were separated into two classes according to the quality of the job: Good quality, where there were no sand streaks at the surface and eight inches or more of the original soil had been brought to the surface; fair quality, where sand streaks showed or less than eight inches of the original soil had been brought up.

Mr. Crews is agronomy specialist for The Soil Conservation Service with headquarters at Hiawatha, Kansas. *He gratefully acknowledges the contributions of Henry W. Schmitz, area conservationist, and James T. Neill, survey supervisor, for aid in assembling the material for this article and in its preparation.*

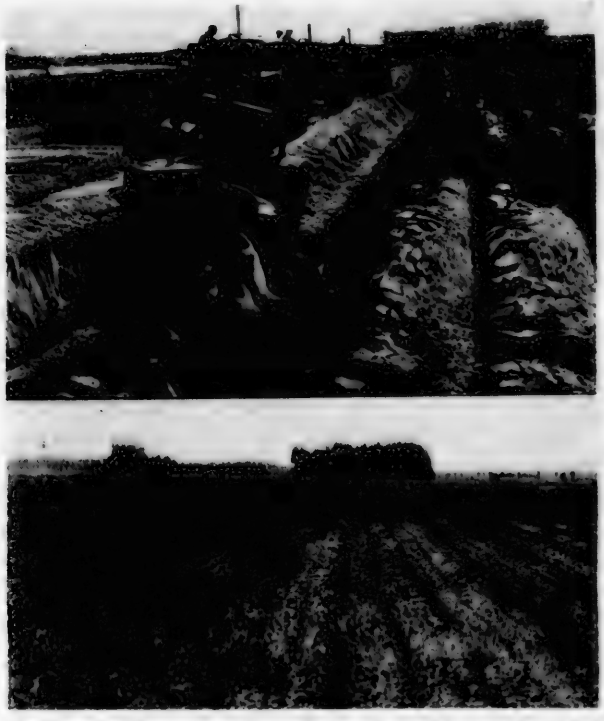

Figure 1.—The upper photo shows deep plowing of sanded land under way in the Hunter's Island precinct, just south of Manhattan, Kansas. Sand deposited by the Kansas River floodwaters on this land averaged about 24 inches deep. Before plowing was begun, the more deeply drifted areas were reduced in depth with a bulldozer-equipped tractor. The 4-foot moldboard plow used for the plowing job was pulled by three D-7 tractors. This picture was taken April 2, 1952. The lower photo shows the same land as it was June 16, 1952, after it had been deep plowed, smoothed up, and planted to corn.

The average yields of corn from the plots are given below in bushels per acre:

Depth of Sand Deposit	Not Deep Plowed	Fair Quality Deep Plowing	Good Quality Deep Plowing
4 to 14 in.	43.3	54.4	67.3
14 to 25 in.	36.3	44.0	69.1
25 to 36 in.	12.3	54.8	66.5

Apparently the quality of the deep-plowing job is important. The top yields, and the most nearly consistent yields regardless of the depth of the sand deposit, came from the plots where a good deep plowing job was done.

The same trend was noticed when the effects of nitrogen fertilizer were examined. Corn yields on fertilized plots where a good quality deep-plowing job had been done were well above yields from other fertilized plots under all rates of nitrogen application and from the unfertilized plots.

The average yields from nitrogen fertilized plots is given below in bushels per acre:

Nitrogen Per Acre	Not Deep Plowed	Fair Quality Deep Plowing	Good Quality Deep Plowing
None	31.1	43.2	61.2
5 to 20 lbs.	31.0	53.6	73.1
21 to 40 lbs.	47.3	49.7	69.4
Over 40 lbs.	20.0	61.6	74.6

Some deep plowing was done on the vegetable-producing land along the lower part of the Kansas River. No check plots of comparable land that had not been deep plowed could be found for comparison, however.

Evidences are that farmers will extend the scope of their deep plowing. Some report that they plan deep plowing where the sand deposits are deeper than had been approved for farmland rehabilitation aid. Others intend to try deep plowing where there is no detrimental deposit on the surface. Still others plan plowing under sand deposits that are thin and not considered important.

One who plowed under a thin coating of sand is Chester E. Spring, who operates the A. I. Froman farm near Lenape. He had some deep plowing done, then used his own 14-inch plow to turn under a cover of sand four to six inches deep on a field he seeded to soy beans. He reported that the soy beans averaged over 25 bushels an acre.

"The effect of plowing the sand under was the same on this land as on the land where the deep plowing had to be done," he commented.

Conserving the Nation's Resources

The soil scientists of America, of which I am proud to be one, are dedicated to the task of conserving the nation's soil, water, and life resources to the end that, whatever, the final population may be, the issue can be met. We feel under obligation to leave no stone unturned to the end that our land is conserved and its productivity is not only maintained but raised to ever higher levels. Our aim is to see that our increasing numbers of fine young folk continue to enjoy the fruits of the earth in abundance.

—FIRMAN E. BEAR, *from Soils and Fertilizers.*

Book Reviews

IRRIGATION DEVELOPMENT AND PUBLIC WATER POLICY. *By* Roy E. Huffman. *336 pages, 5 illustrations, 14 tables. The Ronald Press Company, New York. 1953. $6.50.*

The first chapter reads:

"Historically, the development of new irrigation projects has been considered as a problem of concern primarily to the engineers who build them and to the individuals who settle on the farm units. Agricultural aspects of the total development problem were largely overshadowed by the engineering work involved, and the success of irrigation projects was too often measured in terms of the magnitude of the engineering obstacles overcome.

"More recently, there has been a realization of the increased likelihood of success by farm operators on new irrigation projects if all phases of development are considered in detail. The blueprint of the individual farm and its place in the economy are considered to be as important as the blueprint of the dam, the pumping plant, or the canal."

Ways in which agriculture is becoming increasingly complex and assuming more of the characteristics of commercial production are discussed. Construction costs of new projects are high and frequently a part of a multiple-purpose development. Many of the new projects are in the semi-humid regions where irrigation may not be necessary during years of heavy precipitation. Public irrigation policy should be an integral part of long-range economic and social policy.

Professor Huffman quickly and concisely reviews the history of irrigation through the ages in Asia, Africa, Europe, and America. He points out the effects of the Homestead Act of 1862, the Desert Land Act of 1877, the Carey Act of 1895 and the Reclamation Act of 1902 on irrigation development and public land and water policies.

Water rights are established and administered in irrigated areas because of the scarcity of water relative to demand but there are variations in present water laws between the various states. Since water rights are administered by the states and since streams frequently cross state boundaries, interstate water compacts are necessary. Streams crossing international boundaries must be settled by treaty.

Size of farm units under reclamation projects, development periods and land classification, together with project organization and operation are given attention in this book.

The history of financing modern irrigation developments is traced from the earliest projects in Utah down to our present-day complex reclamation and multiple-purpose projects. The provision of technical assistance to the settlers by public agencies and the merits of land development before settlement vs. land development by the settler are discussed. The importance of good water management and conservation of irrigated land is stressed.

An integrated program for use of irrigated, dry farm, and grazing lands of the west is described, as are ways of developing some of the smaller projects which may be feasible only as part of an over-all coordinated program for an area.

Professor Huffman states: "*The complete development of the resources of a river basin for the benefit and protection of its residents and the rest of the nation is a job of great intricacy and scope.*" Throughout the book he emphasizes the public's interest in water resources and their development and economic feasibility of irrigation in various areas of the United States.

The book contains much forward thinking on the subject and should be useful to employees in public agencies concerned with land economics, agriculture and conservation, and as a college text book.

The author, formerly agricultural economist with the Great Plains Water Conservation and Utilization Program of the U. S. Department of Agriculture and secretary of Montana Natural Resource Council, is now Associate Professor of Agricultural Economics, Montana State College. As a member of the Missouri Basin Regional Research Committee and as consultant to the Missouri Basin Survey Commission, he has been able to keep in close contact with current problems in the field.

—Wayne D. Criddle, *Logan, Utah*

DEVELOPING FARM WOODLANDS. *By* John Frederick Preston, *386 pp., McGraw-Hill Book Company, Inc., New York. January 1954. $4.50.*

This is the second book on the subject of farm forestry authored by Mr. J. F. Preston. His first book, *Farm Wood Crops,* was published in 1949 and was well received by foresters and landowners. *Developing Farm Woodlands* should not be considered as a revision of the author's first book.

The book recognizes the importance of farm woodlands to our nation's forest economy. It further points out that over 250 million acres, 57 per cent of our commercial forest land, is in small woodland ownerships. More than four million farmers and others own these woodlands. Problems associated with the management of these woodlots were discussed last June at the "National Farm Woodlot Conference." The problems of getting landowners to manage these wooded acres so as

to provide for a sustained flow of tree products to meet our needs are many and diverse.

Developing Farm Woodlands is an attractively bound book. The publishers have gotten away from their severely plain maroon colored binding that has been a standard for other forestry publications. The typography is excellent; also the illustrations that pictorially describe their subject.

Mr. Preston has done an excellent job in arranging the subject matter and with clarity and preciseness presents the "what, when and how" of treating trees as a crop.

There are eleven parts to this manual on woodlot management. The first 20 pages cover the subject of "*Growing Wood As A Farm Crop.*" The "how" of "*Starting (Planting) a Farm Forest,*" and its care is discussed under 11 headings. The increasingly important subject "*Managing Farm Woods for Christmas Trees*" is well presented.

Weeding and Releasing Young Trees; Thinning Tree Crops; Pruning Tree Crops; Cutting the Wood Crop; Marketing Wood Products; Managing Farm Woods for Maple Sap; and Managing Farm Woods for Naval Stores; are subject matter titles for other portions of the book. The appendix includes tables and charts that will be an aid in evaluation of tree products.

The comprehensive treatment of the subject matter in this book reflects the life long interest of the author in his profession and particularly as chief, Forestry Division, of the United States Soil Conservation Service. It is the responsibility of this federal agency to work with farmers in planning for the use of land, including the dedication of land to the growing of trees. This direct assistance, on the land action program brought Mr. Preston into contact with landowners and participation in the solution of their woodland problems.

The judicious management of a woodlot is not complicated. Such management is clarified when farmers recognize that trees are a crop just as is other vegetation they have growing on the farm. Reading *Developing Farm Woodlands* can create this understanding and aid in providing confidence necessary to planned action.

This forestry book is built around the theme "*Wood Is a Farm Crop*" and it contains only the simple measures likely to be needed and used by farmers. It is intended primarily for agricultural students and farmers but all owners of small woodlands will find it useful. It is one forestry book which should find a place in the library of all progressive farmers who have woodlands as part of their farms.

—A. C. MCINTYRE, *Upper Darby, Penna.*

THE FORD 1954 ALMANAC FOR FARM, RANCH AND HOME. *Edited by* JOHN STROHM. *Simon and Schuster, New York. 208 pp. $1.00.*

This handy, attractive, paper-bound book might be regarded as a commercial Yearbook of Agriculture. Like the U.S.D.A. Yearbooks of a generation ago, it surveys current advancements in every aspect of agriculture. Its subtitle announces it as "*An Annual Review of Practical, Scientific, and Helpful Information on Farming, Ranching, and Country Living.*"

The format, typography, and illustrations are strictly in the modern trend. Brevity and liveliness are the essence of its text. Cartoons, drawings, charts, and graphs emphasize and illustrate the ideas and facts reported.

Reader interest seems to be the cardinal criterion for inclusion of material. This naturally tends to emphasize the unusual and spectacular. The whole range of agricultural activity is covered, both governmental and private.

Though the book contains many useful facts, it would be disappointing as a reference. But anyone who finds satisfaction in the modern "digest" type of magazine would get his dollar's worth in interesting, effortless reading.

—BEN OSBORN, *Midland, Texas*

FARM MANAGEMENT ANALYSIS. *By* LAWRENCE A. BRADFORD *and* GLENN L. JOHNSON. *John Wiley and Sons, Incorporated, New York. 438 pages. 1953. $5.75.*

The authors have made a praiseworthy attempt to integrate the "traditional" and the "modern" approaches to farm management in this text. The close relationship between learning and management, the subjective nature of managerial decisions, and the use of marginal analysis, mathematical equations and production functions in solving farm management problems highlight the "modern" approach. From the traditional point of view, farm management principles are clearly stated, the illustrations are enlightening and the farm management class questions and problems are of a practical nature.

Soil conservationists will be happy to note the emphasis on the land-use approach to farm organization and farm management. This reviewer agrees with the authors that for a major part of the United States, land is an important fixed factor dictating a large part of the organization of the farm business. Proper land use, soil conservation and water management are stressed as basic in good farm management. The authors recommend extensive use of knowledge and information concerning the capacity of the soil to produce different kinds of crops without irreparable damage to itself. Those conservationists with long years of field experience will commend the authors' evaluation of the importance of organic matter in a farm management program.

The authors approach the farm organization problem in the following manner. They first evaluate the fixed

conditions facing a given farmer at a given time. They then consider land and improvements, cropping systems, livestock systems, labor and equipment programs, and "finally integrate and adjust the component parts on the basis of (1) price and production relationships, (2) the ease with which the inputs and component parts can be adjusted, and (3) the wants and preferences of the farm family."

This reviewer believes it desirable for farm planners and conservationists in reading and studying this text, to first read Chapter 25, "*Farm and Home Planning.*" This chapter leads off "*a realistic illustration of the managerial process needs to (1) cover a series of time periods, (2) be concerned with the consumption pattern and the value structures of the farm family, and (3) allow for change and imperfect knowledge.*"

Conservationists with a mathematical background will readily comprehend the many equations and diagrams in the marginal analysis approach used in this text. Those without mathematical and/or economic training must study the carefully stated and well written text which accompanies the equations and diagrams.

This book is divided into three major sections: (1) management, (2) the problems encountered in organizing and reorganizing a farm and how to solve them, and (3) the problem of managing a farm over a long period.

Personal and personnel phases of farming and farm management, often overlooked in academic treatments of farm management, are given prominent consideration. They delineate the close relationship between the farm business and the farm family and home, while many authors treat the farm business as separate and distinct from the farm family and home. The book is predicated on the conviction that managerial capacity and invaluable personality traits can be taught and/or developed. The authors stress the dynamics of farm management, i.e., change is normal. They show how to develop skills in farm organization and management through study and analysis of the managerial functions.

Capital's important place in successful farm organization and management is well illustrated. The well-known facts are stated: That capital limitations fix the boundaries of the type of organization or reorganization that a farmer may undertake; that sound farm financing and sound family management make possible the achieving of a primary objective in good farming, which is family development. More specific information on farm financing would strengthen this section.

The chapter on "*Use of the General Budget*" teaches the advantages of making mistakes on paper rather than going through the actual costs and hardships of making them in farming.

The last four chapters of the book deal with "the managerial principles useful in handling imperfect knowledge, imperfect foresight and various types of changes." The discussion of these principles brings out the tremendous impact of personal values, wants and desires on the production side of farming.

It should be recognized that the process of integrating the widely divergent schools of farm management thought is no sinecure. The authors acknowledge that they have not attained complete integration. The progressive agricultural student, be he young or old, will commend this text.

—E. L. SAUER, *Urbana, Illinois*

SOILS AND LAND OF MICHIGAN. *By* J. O. VEATCH. *The Michigan State College Press, East Lansing, Michigan, 1953. 241 pages. 136 illustrations. 1 map. $7.50.*

The natural character of the land surface of Michigan and its influence; in association with varying social, economic and political conditions; on land utilization is the subject of this interesting book. It is based on long and critical study of the area by one of America's ablest soil scientists and ecologists.

General descriptions of the physiography, natural vegetation, parent rocks, slope and relief of the state are presented in the first quarter of the book in words and with diagrams. The relationships of these factors to the physical and chemical properties of the soils are outlined in the chapter on Pedology. This account should be valuable for everyone interested in soils of the Great Lakes Region, Podzol and Gray Brown Podzolic areas elsewhere in the world, or in the natural geography of this area as part of a national or world picture. Its scientific accuracy and its lucid presentation are evidence of the acumen of this outstanding teacher of conservation and soil science. It summarizes many of Professor Veatch's unique contributions to the terminology of soil science.

The central two-fourths of the text describes the combinations of all the above natural features of the landscape, that is, the land types or soil associations of specific areas in Michigan. The relation of the natural limitations to the potentialities and utility of each area are skillfully interwoven. Over one hundred photographs of the native vegetation, soil profiles, and land use of different landscapes are assembled in a following pictorial section. (A possible justification of this isolation of the illustrations — their use with both the text map — has not been utilized by references to the figures either in the text or the map legends.) The distribution of each of the 109 soil associations is shown on a large state map (scale 1/750,000) is in an envelope accompanying the cloth bound text and both are enclosed in an attractive cardboard slipcase. A more general picture of the natural landscapes is presented by the use of 10 colors

on the 52 associations of the Upper Peninsula and 13 colors on the 57 associations of the Lower Peninsula. The common characteristics of the areas shown with different colors and the land types on each peninsula are summarized in an adjacent tabular legend. (However, neither legend is arranged numerically and the user must note both the color and the number of the land type area in order to locate its description easily. To locate the discussion of each area on the map in the text, the reader must consult the alphabetical index. It is regrettable that these defects in integration of parts should mar so fine and attractive a publication.) The geographic distribution of the land types is sufficiently detailed to present a general picture of the land resources of each county. The color pattern gives a more general picture of interest from a state or national viewpoint.

In the final quarter of the book, Professor Veatch discusses objectively the geopolitical implications of the natural geography, particularly the areas shown in different colors on the map. The history of the interplay of natural, social, economic and political factors on trends and problems of land use within the various geopolitical subdivisions of Michigan are presented. They are then used as a background for his predictions of future land use trends and land use potentialities.

On the basis of the existing land inventory, recognizing the generalized and incomplete nature of that inventory, the author estimates that Michigan has more than 30,000,000 acres of potentially arable land. Of this total 19,000,000 acres are said to be first and second class land. More than 1,000,000 acres of the first class land are now uncleared or unused. These figures are astonishing when compared to the 12,000,000 tillable acres now in farms and the fact that only about 8,000,000 acres are used annually for harvested crops. He points out that "from the densely populated southern part of the state there is only one direction to go—northward!"

The last chapter deals with the question of a policy for rural land use in Michigan. The author concludes with these sagacious remarks, "*Enlightenment of the individual is the answer to all social and economic problems. Is this too slow? We may be inclined to say yes; then with reflection, ruefully conclude that after all, there is nothing faster.*"

This scholarly and stimulating treatise will be of interest to anyone concerned with land use. Particularly in the Great Lakes region or Podzol and Gray Brown Podzolic areas of the world. In recognition of its monumental nature the Michigan Agricultural Experiment Station has proudly designated it as No. 7 in its Memoir Series.

—E. P. WHITESIDE, *East Lansing, Michigan*

FARM POLICIES OF THE UNITED STATES 1790-1950: A STUDY OF THEIR ORIGINS AND DEVELOPMENT. *By* MURRAY R. BENEDICT. *Twentieth Century Fund. New York 18, N. Y. 548 pp. 1953. $5.00.*

At times farming and politics appear to be almost joint activities in the United States. No other producer in the American economy has been so consistently and continuously involved in politics as the farmer. Originally making up the largest single occupational group in the nation, farmers have been responsible for much of our national and international decisions as well as the legislation specifically affecting agriculture, while the decline in that industry as a source of livelihood has not been followed by a proportionate decrease in the farmer's political influence or general public indifference to farm issues. American farm policy has been a major political and economic issue during the past three decades and undoubtedly will continue to hold a position close to the center of the political arena for some time to come.

Dr. Murray R. Benedict, Professor of Agricultural Economics at the University of California's Giannini Foundation, has made an important contribution of careful scholarship and objective historical interpretation in this survey of American farm policies. Commissioned as a background study preliminary to the Twentieth Century Fund staff project on government and farm programs under the direction of Dr. Benedict and Oscar C. Stine, *Farm Policies of the United States* is an unusually comprehensive record of the farmer's attitudes and problems, the changing economic environment and role of government, and the part played by farmers and their organizations in shaping national policy.

From the inception of farming in this country the pattern of American agriculture departed from Old World practices. The basic American land policy favored the working farmer and the family-type farm while the citizen-farmer showed a keen interest in inflationary programs, such as the Greenback and silver movements, and furnished the major support of the Populist Revolt. In addition to favoring cheap money, the early American farmer generally harbored strongly protectionist views (except in the South where the export of cotton encouraged the acceptance of free trade) and was intensely individualistic. He had strong misgivings about monopolies and trusts and was in the forefront of the fight to establish the Interstate Commerce Act of 1887 and the Sherman Anti-Trust Act in 1890.

By the end of the 19th century the so-called "pioneer" period in American agriculture had closed and the enthusiastic backing farmers gave Theodore Roosevelt presaged a shift to specific legislation in the interests of farmers. The many reforms discussed during the administrations of Roosevelt and Taft had to wait until

Wilson's first term for enactment, but the legislation of this era—such as the Smith-Lever Act, the Federal Warehouse Act, and the Federal Land Bank Act—established much of the basic agricultural policy of the federal government.

World War I brought temporary prosperity to the farm and an inflationary spree that was followed by a severe depression, which was partly responsible for the emergence of militant farm organizations, such as the American Farm Bureau Federation, and the formation of the powerful Farm Bloc in Congress. Increasingly farm organizations turned from general palliatives, such as cheap money, to unilateral aids designed to shield the farmer from the more extreme effects of the free market. As is well known, however, intervention with the marketing process reached its highest point during the Great Depression of the '30s and left a heritage of federal controls and depression psychology which extends to the present day.

But long-run economic position for agriculture is much better than is commonly assumed, according to Dr. Benedict. Neither the fear of crop surpluses and poor markets nor the widespread reliance on government aid is justified by future economic prospects. Farmers as a whole are enjoying high levels of income and their economic position, save for temporary reversals, is likely to continue to improve.

> . . . The world of the future is far more likely to be concerned over shortages than over surpluses. In the United States, population has doubled since 1900 and still is growing rapidly. New land brought into production will be at increasing cost and of lower productivity. Gains in productivity on lands already in use probably will be higher-cost gains than those of the past. Thus, the terms of trade for agriculture seem likely to be more favorable as time goes on, since it is easier to balance output with demand in a situation where cost per unit increases at output increases than where larger production can be had at lower per-unit costs. (P. 520.)

The crux of the matter, of course, is whether the growth in population will outrun the secular increase in output per farm.

Whether one shares Dr. Benedict's optimism concerning the farmer's future or not, however, *Farm Policies of the United States* is an authoritative and useful study in agricultural history. It is a panorama of American agriculture from its early beginnings to the present, as well as an encyclopedia of historical information. An unusually extensive index greatly increases its usefulness for both the serious student and the browser.

—L. G. HINES, *Hanover, New Hampshire*

PROCEEDINGS OF THE FOURTH AMERICAN FOREST CONGRESS. *Edited by* THE AMERICAN FORESTRY ASSOCIATION STAFF. *372 pp. The American Forestry Association, Washington 6, D. C. 1953. $3.*

This is the word-for-word reporting of the Fourth American Forest Congress held in Washington, D. C., October 29-31, 1953, under the auspices of the American Forestry Association. It covers six sessions of the Congress under the following subjects: *Over-all Opportunities and Aims, Forest Management, Multiple Use of Forest Lands, Forestry Research and Education, Forest Landownership, and Summary.* In each session, principal speakers and discussion panelists alike presented their views of the tentative program which had been previously drawn up by a small group of conservation leaders at Higgins Lake, Michigan. It is this tentative program, as further modified by the thinking of the participants of the Congress, that will eventually serve as the framework for a permanent program of sound forestry development for the American Forestry Association.

The thinking expressed at the Forest Congress was remarkably unified, considering the diversity of the individuals and groups represented. The spokesman for the Eisenhower Administration emphasized the rights and responsibilities of the individual and reassessed the role of the Federal government in resource development. Those speaking for industry pointed with obvious pride to the accomplishments of good forestry on private lands. The majority of organizations at the Congress reached broad areas of agreement as to the dominant problems still remaining in establishing the principles of good forestry on a national basis, but not all agreed on the best approach to this goal. The strongest dissenting voice to a general agreement was expressed by the CIO representatives, who talked largely in terms of federal regulation and increased domination by the Federal government in future forestry programs.

A masterful job of summarization of the Congress was made by George A. Garratt, Yale University School of Forestry, who concluded that "*the present situation of American forestry is neither so good as to justify complacency, nor so poor as to warrant alarm.*" He pointed logically to the fact that in a democracy no program of conservation can be expected to reflect rigid order and consistency. Neither will any one group, whether they be private enterprise, government, organized labor, or the ivied halls of the universities, be able to develop this program solely according to its own thinking.

Every person who is interested in the best development of the forest resources of this country should give careful study to the thinking expressed at the Congress and recorded in the *Proceedings.*

—HARRY S. MOSEBROOK, *Washington, D. C.*

Wildlife Management. *By* DURWARD ALLEN. *A Merit Badge Series. Boy Scouts of America, 2 Park Avenue, New York 16, N. Y. 95 pp. Illustrated. 1952. 25 cents.*

Dr. Allen, in his usual clear and understanding style, emphasizes the basic wildlife management principles in a manner that can easily be grasped by Boy Scouts. He also discusses the interrelationships of animals, soil, water and vegetation; also the harmful effect of drainage, fire and other improper land use practices upon wildlife.

The pamphlet is one in a series of four — each featuring a basic natural resource.

How to Grow Minnows. *By* PHILIP ALLAN. *P. O. Box 9343, Fort Worth, Texas. Illustrated. 63 pp. 1952. $1.00.*

This practical book on minnow growing by a recognized biologist was prompted by the pollution and siltation of streams which cut back the supply of wild minnows to bait fishermen. The book covers pond designs, how to stock and fertilize ponds, kinds of minnows to grow, how to overcome hazards, some experiences of successful growers, diagrams, charts and suggestions for fishing clubs. It is well written and no person now in the bait business or others expecting to enter should be without this authoritative book. In fact, the book should be in the library of every conservationist working with landowners and fishermen concerned with clean supplies of water for fishing.

Farm Game. TENNESSEE GAME AND FISH DEPARTMENT. *Nashville, Tennessee. 16 pp. Illustrated. 1953.*

Soil Conservation and Management on Sandy Farm Land in Northeast Nebraska. *Bulletin 420. By* F. L. DULEY, J. C. RUSSEL, T. H. GOODDING AND R. L. FOX. *Experiment Station, University of Nebraska, Lincoln, Nebraska. 40 pp. Illustrated. 1953.*

Obstacles to Conservation on Midwestern Farms. MISSOURI BULLETIN 574. NORTH CENTRAL REGIONAL PUBLICATION 28. *University of Missouri, Columbia, Missouri. 58 pp. Illustrated. 1952.*

U.S.A. 1975-2000 A.D. People vs. Resources. *Volume IX, Numbers 3 and 4. Population Reference Bureau, Inc., 1507 M Street, N. W., Washington 5, D. C.*

New Films

The Soil Conservation District. *16 mm., sound. 14½ minutes. Sponsored by The Keystone Steel & Wire Company and produced by The Venard Organization, Peoria 2, Illinois.*

Soil conservation district supervisors at the convention of the National Association of Soil Conservation Districts in New Orleans, Feb. 23-25, 1954, were treated to a premiere showing of a dramatic new motion picture entitled *The Soil Conservation District.*

The 14½-minute sound color film was produced by the Venard Organization of Peoria, Illinois, as one of the *Agriculture on Parade series.* It builds a concise and convincing story around a country newspaper editor who believes in soil conservation and in soil conservation districts and whose influence and advice saved a farmer friend from losing his farm. In the process, viewers get a clear picture of how and why soil conservation districts are organized, how they operate, and what the soil and water conservation program means to individual farmers and to their communities.

Under sponsorship of the Keystone Steel & Wire Company, the Venard Organization will distribute the film, limiting its use for the time being to television showings throughout the country.

The Soil Conservation Society of America, Soil Conservation Service and soil conservation districts were consulted in the process of producing this film, and it was given a good reception at New Orleans by the supervisors, who hail it as filling a big gap in available educational materials that tell the soil conservation district story.

What Is A Soil Conservation District?

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"The Soil Conservation District"

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Making the Most of a Miracle. *16 mm., sound and in color. Running time 27 minutes.* AMERICAN PLANT FOOD COUNCIL, *910 17th Street, N. W., Washington 6, D. C.*

"Making the Most of a Miracle" is woven around the fascinating story of plant nutrition, told interestingly and simply in color.

Nationally-known scientists were consulted in the production of the film, which is authentic in detail and time-lapse photography, animation and carefully selected farm scenes dramatically are employed in telling the story of plant growth.

When the preview showing of the film was held in Washington recently, nationally-known leaders in the field of agriculture, education, conservation, research, and farm organization officials were generous in their praise of the production. They described the film as not only educational, but entertaining—suitable for adults and youth groups and an outstanding "teaching tool" especially useful to agricultural, as well as other teachers.

Business Screen Magazine, for example, had this to say:

"The American Plant Food Council, which represents many of the leading producers of chemical fertilizers, has been pretty careful not to make this film a sales tool or even an educational project in the promotion of fertilizers. It does say that you can't take away from the soil without giving back the elements it needs. The film fully demonstrates the importance of tilth and other conditions besides the necessary chemical elements, and, without controversy, authoritatively scotches the notion that the basic form of the necessary added soil elements is a more important factor than their quantity or balanced composition. One of the best scenes shows a man planting his seed in the spring, full of 'faith and hope reborn.' This—the miracle of growth—is the spirit of the film."

The success of the film is attested by the demands for showings and already, more than 200 prints are in daily circulation. Prints may be borrowed, without cost, except for return transportation, by writing to: Director of Information, American Plant Food Council, Inc., 910 17th Street, N. W., Washington 6, D. C.

Because of the demand, the Council has asked soil conservation workers and others desiring to use the film, to give a selection of dates.

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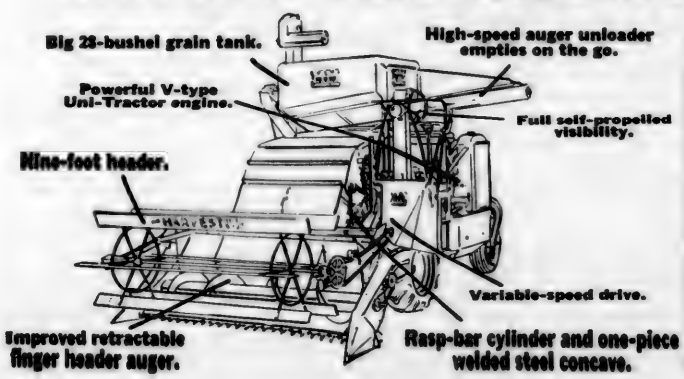
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Annual Land Judging Contest Scheduled for Oklahoma City

All roads will lead to Oklahoma City in April as the National Land Judging Contest goes into its third year with special sections of land appreciation schools and a new method of teaching pasture and range management as added inducement to entries. Dates for this year's contest are April 29-30, with April 19 set as the entry deadline. Entries should be sent to Edd Roberts, Extension soil conservationist, Oklahoma A. & M. College, Stillwater, Oklahoma.

The contest, sponsored by stations WKY and WKY-TV in Oklahoma City in cooperation with state farm agencies, has a history of being the first land judging meet to draw entries from the entire nation. Begun in 1952, the contest has steadily grown until entries numbering 2,000 are expected this year.

Land judging as a method of teaching soil conservation and improvement has spread to approximately 30 states since its beginning in Oklahoma. The actual method of judging was originally patterned strictly after another agricultural teaching method—that of livestock judging. In a attempt to improve the methods of teaching, a special study was made in Indiana during the summer of 1953 where the score card to be used at this year's national contest was developed. It was brought out at that session that a land judging contest of a national or regional nature would be possible anywhere in the United States provided the contestants had one day for advance study of local soils where the contest was to be conducted.

Thus, the Oklahoma event will begin with what is termed a land appreciation school for both coaches and contestants designed to initiate visitors to Oklahoma soils and equalize the actual judging. In charge of these schools will be Edd Roberts, one of the originators of the national judging meet.

Prizes offered in this year's contest will amount to $2,200 in the form of cash, trophies, plaques and medals. Special regional prizes of $50 will go to winning 4-H and FFA teams from each of the four Extension regions of the United States.

There are five entry divisions in the contest this year, namely 4-H, FFA, Adult, Collegiate and Women and Girls. While this last division may sound peculiar in a land judging contest, Roberts points out that 11 per cent of the land in the nation is owned by women and not a few of them are highly interested in soil judging.

Judging teams for the national contest will be comprised of four individuals each. Out-of-state entries in the junior and adult divisions are unlimited. Limitations set in the collegiate division will permit two teams from any college. Oklahoma junior division entries will be limited to one 4-H and FFA team from each county in the state.

Cardon Named Director-General Food and Agriculture Organization

Dr. Philip Vincent Cardon of the United States was unanimously acclaimed the new Director-General of FAO on December 9 during the Seventh Session of FAO's Conference in Rome, Italy.

Dr. Cardon, former administrator of the Agricultural Research Administration of the United States Department of Agriculture, has been closely associated with FAO since its inception.

The new director-general is FAO's third administrator. He succeeds Norris E. Dodd of the United States, who has served for the past five years. FAO's first director-general was Lord Boyd Orr of the United Kingdom, who served from 1945 to 1948.

Dr. Cardon is one of America's leading agricultural scientists and research administrators.

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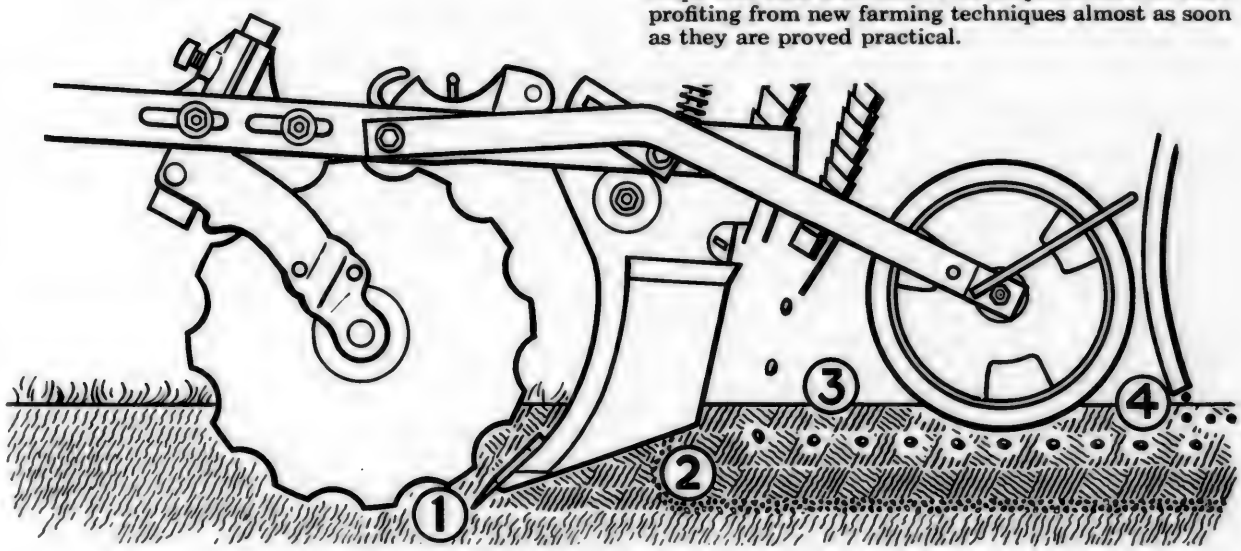

The McCormick pasture renovator places commercial fertilizer, nurse crop, and grass seed together in each of seven strips spaced eleven inches apart.

1. **Colter cuts sod. Diamond-point applicator makes narrow trench as deep as 4 inches.**
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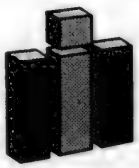
3. **Oats and other unhulled seeds are released ahead of the press wheels which firm soil around them.**
4. **Clover and other hulled seeds fall into moisture-holding grooves either before or after the press wheels.**



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On the ordinary front steer, rear drive motor grader, the front end is just that much dead weight which the rear end has to push around. *Total* weight is not the measure of motor grader operating efficiency. What counts is the useful working weight carried on driving wheels; all other weight consumes power, and is a definite handicap.

On the Austin-Western Power Grader, there are no idling front wheels . . . no dead front end to consume power and decrease operating efficiency. All weight is on driving wheels—front and rear—contributing 100 percent to traction. Dynamometer tests, conducted with the greatest accuracy, have proved conclusively that with two graders of the same weight and horsepower, working in first or second gear where real earthmoving is done, an all-wheel drive machine has 30 percent more power-at-the-blade than one with rear drive only.

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1954 NATIONAL COMMITTEES

Committees for 1954 have been appointed by President Bailey. Space will not permit the listing of entire committees but the major standing committees and the chairmen together with addresses are listed below. Any member desiring to contact the committee should correspond directly with the chairman.

Annual Meeting Program Committee: T. B. Chambers, Soil Conservation Service, P. O. Box 612, Spartanburg, S. C. *Resolutions Committee:* Lloyd E. Partain, Curtis Publishing Company. Independence Square, Philadelphia, Pa. *Finance Committee:* Russell G. Hill, Michigan State College, 412 Agriculture Hall, East Lansing, Mich.

Annual Meeting Local Arrangements Committee: Howard R. Bissland, Soil Conservation Service, P. O. Box 3149, Orlando, Fla. *Annual Meeting Publicity Committee:* Louis E. Reid, Jr., Country Gentleman Magazine, Apt. 802, 347 E. Pace's Ferry Rd., N. E., Atlanta, Ga.

Membership Committee: Harold M. Rhodes, Soil Conservation Service, RFD #5, Morgantown, W. Va.

Business and Organization Relations Committee: Howard F. Barrows, Austin-Western Company, Aurora, Illinois. *Overall Program Committee:* John Lamb, Jr., Soil Conservation Service, 411 Center Building, Upper Darby, Pa.

Spanish Edition Glossary Committee: William H. Gracia, Soil Conservation Service, Box 4671, San Juan, Puerto Rico.

Basic Objective and Overall Philosophy Committee: J. K. Vessey, U. S. Forest Service, Old Federal Building, Missoula, Mont.

Nominations Committee: Bernard Frank, U. S. Forest Service, 4210 South Agricultural Building, Washington, D. C. *Elections Committee:* O. R. McMurry, State Soil Conservation Committee, Statehouse, Des Moines, Iowa.

Fellows and Honorary Member Committee: R. H. Musser, Soil Conservation Service, South Agricultural Building, Washington, D. C. Archives Committee; R. H. Musser. (Address same as above).

Student Chapter Committee: Roy P. Matelski, Agronomy Department, University of Nebraska, Lincoln, Nebr.

Organization and Policy Committee: Roy D. Hockensmith, Soil Conservation Service, South Agricultural Building, Washington, D. C.

The *Chapter Activities Committee* has been enlarged. Harold L. Dean Soil Conservation Service, Box 1898 Fort Worth, Texas will serve as chairman. Sub-committees set up are: *Chapter Achievement* with A. L. Fleming, Teachers College, 203 Wicomico Street, Salisbury, Md., Chairman; *Chapter Programming:* W. W. Carpenter, Soil Conservation Service, 732 McCleland Bldg., Lexington, Ky., Chairman; *Chapter Handbook:* John A. Grant, Manager, Upper Monongahela Valley Association, Peoples Building, Fairmont, West Virginia.

Technical Committees of the Society continue to function under the direction of E. H. Graham, Soil Conservation Service, South Agricultural Building, Washington, D. C.

PRESIDENT —Con't from page 2

the number of chapters and also to activate some of our dormant chapters. We must bring in new chapters where they are needed. We also must find ways and means of stirring some of our near-dormant chapters to greater activity.

Before leaving Spartanburg, I had a couple of sessions with Jack Chambers, our 1954 Annual Meeting Program Chairman, and he is getting started toward the development of an interesting program at Jacksonville November 15-17. It is not too early to speak to some of your friends about making up a carload to attend the meeting in Jacksonville. We want you there.

Howard Bissland, Chairman of our Committee on Local Arrangements, gave me a preview of some of his plans and I know you are going to be interested. You will be given some of the interesting details a little later.

The response of members who were asked to serve on committees has been very fine. Less than a half dozen declined—always for sound reasons. We didn't have a single declination on grounds of dissatisfaction or lack of interest.

Let's get settled down to a year of productive work for the Society. If your chapter is not active, talk to your chairman and any other members within your reach and see if you can start something cooking. We need a strong, virile professional society in the broad field of soil and water conservation. We can have such a society only through active chapters. After your chapter does something that might be of interest to others, send Wayne Pritchard a report of it. He needs such information.

R. Y. BAILEY

DISTRICT SUPERVISOR USES "DOWN THE RIVER"

Marsh Knotl, North Carolina Soil Conservation District Supervisor, is shown discussing "Down the River" with sixth grade students in his district. Mr. Knotl's district has made extensive use of the publication in their soil conservation program with schools.

CHAPTER NEWS

Wm. Penn: During a meeting on December 10th at Lansdowne, Pa., Fred H. Larson was elected chairman for 1954. Alan P. Mewha was selected for vice-chairman while William R. Moore will serve as secretary. The Chapter recently sold 4,500 copies of *"Down the River"* to Wm. H. Murray Electrical Shops at Paoli, Pa.

Wisconsin: The newly organized Wisconsin chapter (previously Milwaukee) held a meeting at Madison on February 4th. It is conducting an intensive membership drive, developing new plans and already making arrangements for the national meeting in 1955.

Officers elected for 1954 include: I. O. Hembre, chairman; Emil Truog, vice-chairman; Kenneth Neitzel, secretary; Hugh Highsmith, treasurer; Everett Swingle, Peder Lund and Cy Kabat, council members.

Pony Express: The chapter received its charter on March 16th during a dinner meeting at the Eldridge Hotel in Lawrence, Kansas. H. Wayne Pritchard, national secretary, was present for the occasion.

Hoosier: The fall meeting of the chapter was held at Butler University on November 13, 1953. Discussion centered on teaching of conservation in the schools. Howard Michaud of Purdue University was the leader. Other speakers were: Prof. Barton, Indiana University; Joe Metzger, Vocational Teacher; J. R. Craw, School Superintendent; Russell Rayburn, State Department of Public Instruction, and Harry Eby.

Officers elected for 1954 were: H. F. Helfenbein, chairman; S. E. Bowman, vice-chairman; Eugene B. Leedy, treasurer; Lawrence McKinney, council member, and Mayhew M. Clark, secretary.

CHAPTER NEWS

Washington, D. C.: The chapter is holding regular monthly meetings. On March 10th Congressman Clifford Hope spoke to the group and was presented with his Honorary Membership bestowed by the parent organization.

At the February meeting Bernard Frank discussed erosion conditions in the Rock Creek Drainage. The January meeting centered around a panel discussion on *"Mid Century Conference on Resources for the Future."* Participants included: E. H. Graham, Miss Annette Flugger, Wm. Swingler, and Evan L. Flory.

Officers for 1954 include: W. J. Endersbee, chairman; T. L. Ayers, vice-chairman; A. M. Hedge, secretary.

West Texas: The Chapter held a meeting at Camp Rice Arroyo near El Paso on December 12th. Theme of the meeting was *Upstream Small Watershed Flood Prevention*. J. H. Johnson, acting watershed conservationist in Texas, led the discussion on flood prevention work being carried out on small watersheds of the Trinity River. During the summer of 1953 this work prevented a flood which, uncontrolled, would have caused an estimated $100,000 damage to farms, irrigation installations, highways, and railroads in the El Paso Valley.

Michigan: The chapter held its regular annual meeting on February 4, 1954, at the Memorial Union Building, Michigan State College, East Lansing. The meeting was held in conjunction with Michigan Farmer's Week at the College.

A business session was held during which time the various committees reported their activity for the year.

In the evening a banquet was held with Tom Wilkinson, Ethyl Corporation, Detroit, serving as toastmaster. Elmer Taylor, immediate past chairman, and Win Harrison were recognized by the chapter for their work during 1953.

H. Wayne Pritchard, national secretary, spoke on the activities of the national organization. Robert Parks, Associate Professor of Government, Iowa State College, discussed *"Federal and State Relationships."*

During the election Dale Ball was determined to be the chairman for 1954. Paul Miller will serve as vice-chairman and Winfield Harrison was reelected as secretary.

Inland Empire: The Inland Empire Chapter held a meeting at the Spokane Hotel in Spokane on Tuesday evening, December 29th. It was held in conjunction with the two-day meeting of the Northwest Scientific Association. John L. Schwendiman served as chairman of the evening. Douglas Hole discussed: *"Advantages of Belonging to SCSA,"* while Paul McGrew talked on *"Soil Conservation Service Reorganization."* Hilmer Axling spoke on *"Conservation is Everyone's Business."*

During the election of officers, G. O. Baker assumed the chairmanship while Ray W. Chapin will be secretary.

Piedmont: Seventy members and guests attended the winter meeting at the Lord Baltimore Hotel in Baltimore on January 5th.

John Henry Magness, a young dairy farmer near Bel Air, told of his four months' stay in the Netherlands last summer. He presented colored slides of agricultural methods and scenes in the Netherlands.

John Lamb, chairman of the national program committee, discussed activities of the parent organization.

Hugh Hancock of the membership committee reminded the group they were committed for a 50 per cent increase in membership.

Officers elected for 1954 were: John S. Smith, chairman; Lester H. Ahlswede, vice-chairman; Paul A. Anderson, secretary.

Lincoln: The chapter held a meeting in the Foods and Nutrition Building at the University of Nebraska on February 8th. Evan Hartman was in charge of the program and introduced Dick Wiese of the Nebraska Student Chapter who gave his observations in regard to the annual meeting at Colorado Springs. Adrian Fox discussed activities of the parent organization.

Officers elected for 1954 were: H. G. Bobst, chairman; W. L. McMullen, vice-chairman; Louis Glymph, secretary, Jack Steele, council member.

Southern New England: The annual winter meeting of the chapter was held in Worcester, Mass., on January 18th. (No report of meeting is available.) The following were elected as officers for 1954: N. Paul Tedrow, Hartford, Conn., chairman; Karol Kucinski, University of Mass., Amherst, vice-chairman; W. Theodore Hebel, Hartford, Conn., secretary; Arthur Fox, Clinton, Mass., treasurer. Limestone: Officers of the chapter for 1954 include: William C. Butler, Edmonton, chairman; David Walden, Tomkinsville, vice-chairman; Fred Allcock, Elkton, secretary-treasurer.

North Carolina: The 1954 officers of the chapter include: John C. Jester, chairman; J. D. Thompson, vice-chairman, Woodrow Haskins, secretary; C. L. Hunt, council; R. M. Dailey, council; John L. Brown, council.

Northeast Oklahoma: The Northeast Oklahoma Chapter met at Pryor on January 29th. Warren M. McCarty led a round table discussion of *"Midland Bermuda Grass in Relation to Coastal and Common Bermuda in Northeastern Oklahoma."* Midland Bermuda is a hybrid developed by Dr. Burton at the University of Georgia by crossing Coastal and Indiana 13. It has been endorsed in Oklahoma by the Experiment Station.

"In the light of present information," McCarty said, "it would seem that we can now produce hay, pasture and silage from our Bermuda Grass without tilling the land if proper management is observed."

New officers elected included: K. C. Bennett, chairman; E. T. McCollum, vice-chairman; Wilber E. Parrish, secretary-treasurer.

Northern New England: The annual fall meeting of the Northern New England Chapter was held at Dover, N. H., on October 9 and at Durham on October 10th.

Hugh Tuttle, Director of the National Association of Soil Conservation Districts, spoke on local and national conservation affairs.

On Saturday morning a tour of the Tuttle Farm was made where the group observed cropland terraces, ponds, irrigation and woodland improvement. The group also visited the Gene Moore Farm, owned by the University of New Hampshire, where they observed a drainage project.

The members enjoyed a chicken barbecue and saw the football game between Maine and New Hampshire.

E. A. Adams, County Agent, Rochester, New Hampshire, was elected chairman; Lewis E. Parlin, Ass't State Conservationist, University of Maine, was elected 1st vice-chairman; Walter F. Mead, Work Unit Conservationist, Milford, N. H., was elected 2nd vice-chairman; Harold M. Pulling, Work Unit Conservationist, Rutland, Vermont, was elected secretary-treasurer.

Red River Valley: The chapter will hold a meeting in Grand Forks, N. Dak., on March 13th at which time the Charter was presented. Since the first organization meeting held at Detroit Lakes, Minn., in August the chapter has expanded to include 56 members.

North Dakota: Plans are under way for a series of meetings and the organization of one or more chapters in Western North Dakota. With the chapters spread on a geographical basis over the state the former state wide chapter will probably request to be dissolved. Membership in the State of North Dakota has increased over 400 per cent during the past year.

San Francisco Bay: The chapter has been holding regular monthly meetings. The group met on December 14, 1953, in the Forestry Building, University of California. A short business meeting was held. It was announced that Ted Colman's book, *"Vegetation and Watershed Management,"* was now off the press.

Chairman Clark Gleason introduced Les Simonsen, Mt. Diablo Council, Boy Scouts of America, who spoke on the activities of the local Scout movement. The Chapter went on record as acknowledging the Boy Scout Conservation Program and offered to assist in any way possible.

Program Chairman Upchurch introduced a panel to discuss the topic *"Land Tenure as a Factor in Conservation."* Members of the panel included Cruz Venstrom, California Farm Bureau Federation; Wells Hutchins, Agricultural Research Service; J. H. Snyder, Division of Agricultural Economics. The panel was moderated by Upchurch. Snyder spoke on *"Public Control of Private Land Use."* Venstrom discussed *"Private Use of Public Lands — Public Use of Private Land."* Hutchins spoke on *"Tenure in Water."*